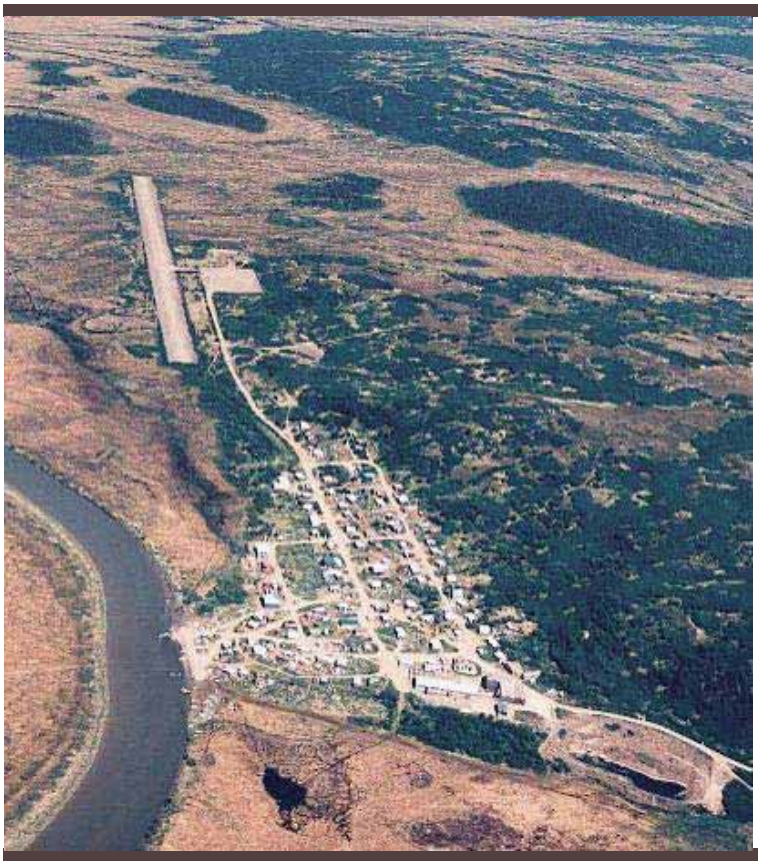
MANOKOTAK AIRPORT RELOCATION



PROJECT NO. 55313

ENVIRONMENTAL ASSESSMENT

DRAFT

July 2005

Prepared for:
Federal Aviation Administration
Airports Division – AAL 600
222 West 7th Avenue, Box 14
Anchorage, Alaska 99513

On behalf of the sponsor:
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Department of Transportation &
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ENVIRONMENTAL ASSESSMENT

Manokotak Airport Relocation
Manokotak, Alaska

Project No. 55313
AIP No. 3-02-0171-0206

Prepared for:
Federal Aviation Administration

Prepared on Behalf of the Sponsor:
Alaska Department of Transportation & Public Facilities
Central Region

This Environmental Assessment is approved by the Alaska Department of Transportation and Public Facilities with the following signatures:

Gordon C. Keith, P.E., ADOT&PF, Central Region Director **Date**

K. Kim Rice, P.E., Chief, ADOT&PF Pre-Design & Environmental **Date**

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This Environmental Assessment becomes a federal document when evaluated and signed by the responsible federal official.

Responsible FAA Official **Date**

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AIRPORT DEFINITIONS

(As defined in FAA AC 150/5300-13, Airport Design, and FAR Part 77, Objects Affecting Navigable Airspace)

Airport Reference Code (ARC)	The ARC is a coding system used to relate airport design criteria to the operational and physical characteristics of the airplanes intended to operate at the airport. The ARC has two components relating to the design aircraft. The first component, depicted by a letter, is the aircraft approach category and relates to the aircraft approach speed. ***MANOKOTAK No-Build*** ***MANOKOTAK Proposed*** ➢ Category A: Speed less than 91 knots. ➢ **Category B: Speed 91 knots or more but less than 121 knots.** Category C: Speed 121 knots or more but less than 141 knots. Category D: Speed 141 knots or more but less than 166 knots. Category E: Speed 166 knots or more. The second component, depicted by a Roman numeral, is the airplane design group and relates to the airplane wingspan. ***MANOKOTAK No-Build*** ***MANOKOTAK Proposed*** ➢ Group I: Up to but not including 49 feet. ➢ **Group II: 49 feet up to but not including 79 feet.** Group III: 79 feet up to but not including 118 feet. Group IV: 118 feet up to but not including 171 feet. Group V: 171 feet up to but not including 214 feet. Group VI: 214 feet up to but not including 262 feet. The combination of the approach category and design group is the ARC, shown as A-I, B-II, etc.
APPROACH Categories: ***Nonprecision Instrument Approach (NPI)*** ***MANOKOTAK Alternatives E1 & R3***	An instrument approach providing course guidance without vertical path guidance. Instrumentation required for NPI approaches include VOR, NDB, LDA, GPS or other authorized runway navigational aid systems. Authorized instrument procedures are developed and published in the US Terminal Procedures Manuals. NPI approaches allow operations during certain inclement weather conditions. **Approach minimums depend on a number of conditions. Due to the surrounding terrain, NPI approach minimums are limited for Alternative E1 and the No-Build Alternative.**
Visual Approach ***MANOKOTAK No-Build***	A runway intended solely for the operation of aircraft using visual approach procedures, with no straight-in instrument approach procedure and no instrument designation indicated on an FAA-approved airport layout plan, a military service approved military airport layout plan, or by any planning document submitted to the FAA by competent authority.
Object Free Area (OFA)	An area on the ground centered on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.
Primary Surface	"A surface longitudinally centered on a runway...when the runway has no specially prepared hard surface [pavement], the primary surface ends at the end of the runway. The elevation of any point on the primary surface is the same as the elevation of the nearest point on the runway centerline. The width of the primary surface is:" ***MANOKOTAK Alternatives E1 & R3*** (2) 500' for runways having NPI Approaches for aircraft with greater than 12,500 lbs. maximum takeoff weight. Objects penetrating this surface are considered obstructions to airspace. **Manokotak's design aircraft is <12,500 lbs. However, occasional operations by larger aircraft are expected, so protection of that airspace is considered prudent.** ***MANOKOTAK No-Build*** (1) 250' for utility runways having only visual approaches (minimum dimension provided by the Federal Regulations for Civil Airports). Objects penetrating this surface are considered obstructions to airspace.
Runway	A defined rectangular surface on an airport prepared or suitable for the landing or takeoff of airplanes.
Runway Protection Zone (RPZ)	An area off the runway end to enhance the protection of people and property on the ground.
Runway Safety Area	A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway.
Transitional Surface	These surfaces extend outward and upward at right angles to the runway centerline and the runway centerline extended at a slope of 7 to 1 from the sides of the primary surface and from the sides of the approach surfaces. Transitional surfaces for those portions of the precision approach surface which project through and beyond the limits of the conical surface extend a distance of 10,000' measured horizontally from the edge of the approach and at right angles to the runway centerline.

ACRONYMS AND ABBREVIATIONS

AASP.....Alaska Aviation System Plan

AC .....Advisory Circular

ACMP..... Alaska Coastal Management Program

ADCED ..... Alaska Department of Community & Economic Development

ADOL.....Alaska Department of Labor

ADEC .....Alaska Department of Environmental Conservation

ADF&G..... Alaska Department of Fish & Game

ADNR.... Alaska Department of Natural Resources

ADOT&PF.....Alaska Department of Transportation & Public Facilities

AEA-RPSU .....Alaska Energy Authority – Budget Request Unit

ALP ..... Airport Layout Plan

ANCSA .....Alaska Native Claims Settlement Act

ARC..... Airport Reference Code

ATV..... All-Terrain Vehicle

AWOS..... Automated Weather Observation System

BBAHC .....Bristol Bay Area Health Corporation

BBHA..... Bristol Bay Housing Authority

BBNA.....Bristol Bay Native Association

BBNC ..... Bristol Bay Native Corporation

BIA ..... Bureau of Indian Affairs

BLM .....Bureau of Land Management

BMPs..... Best Management Practices

CPQ .....Coastal Project Questionnaire

CRSA..... Coastal Resource Service Area

EA..... Environmental Assessment

EFH .....Essential Fish Habitat

ESCP ..... Erosion and Sediment Control Plan

FAA.....Federal Aviation Administration

FAR .....Federal Aviation Regulations

GPS ..... Global Positioning System

HMCP .....Hazardous Materials Control Plan

HUD..... U.S. Department of Housing & Urban Development

IFR ..... Instrument Flight Rules

M&O.....Maintenance & Operation

MAP.....Missed Approach Point

MDA ..... Minimum Descent Altitude

Medevac..... Medical Evacuation

MIRL .....Medium Intensity Runway Lighting

NMFS.....National Marine Fisheries Service

NPDES.....National Pollution Discharge Elimination System

NPI .....Non-Precision Instrument

NWR .....National Wildlife Refuge

PAPI.....Precision Approach Path Indicators

PDC.....PDC, Inc. Consulting Engineers

PSS..... Palustrine Scrub-Shrub

PSS/EM..... Palustrine Scrub-Shrub/Emergent

REIL..... Runway End Identification Lighting

RPZ ..... Runway Protection Zone

SAT Plan.....*Southwest Alaska Transportation Plan*

SHPO .....State Historic Preservation Officer

SREB ..... Snow Removal Equipment Building

SWAMC ..... Southwest Alaska Municipal Conference

SWPPP ..... Storm Water Pollution Prevention Plan

USACE .....U.S. Army Corps of Engineers

USDA.....U.S. Department of Agriculture

USFWS .....U.S. Fish & Wildlife Service

USGS ..... U.S. Geological Survey

VSW.....Village Safe Water

See Airport Definitions for abbreviations of other airport design terminology.

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1.0 SUMMARY

The Alaska Department of Transportation and Public Facilities (ADOT&PF), in cooperation with the Federal Aviation Administration (FAA), is proposing improvements to Manokotak Airport in Manokotak, Alaska. Located in the Bristol Bay region, Manokotak lies on the Igushik River, about 25 miles southwest of Dillingham and 347 miles southwest of Anchorage (Figure 1). Manokotak is one of the newer villages in the Bristol Bay region. It became a permanent settlement in 1946-7 when the villages of Igushik and Tuklung consolidated. In 1970, Manokotak incorporated as a Second Class City under Alaska Statutes. The Alaska Department of Community and Economic Development (ADCED) reports Manokotak's population as 404 in 2002; over 94% are Alaska Natives, primarily Yup'ik Eskimo. The proposed project is within Township 14 South, Range 58 West in the Seward Meridian.

Manokotak residents depend heavily on the airport for essential services such as passenger transportation, bypass mail, cargo delivery, and medical evacuations (medevac). Air transportation is the primary source of travel to and from the community. No roads connect Manokotak with other communities. There is a winter trail to Dillingham and Twin Hills, but this trail is impassable during the summer due to swampy conditions. Barges travel to Manokotak along the Igushik and Weary Rivers during the summer.

The purpose of the proposed project is to provide:

- A safe airport that meets FAA standards for the current and future air traffic
- Improved access for medevac aircraft and larger passenger and cargo aircraft

The project is needed to correct conditions that do not meet FAA standards and the State of Alaska's established requirements for community airports. ADOT&PF proposes to remedy these deficiencies by:

- Expanding the runway to accommodate the design aircraft with Non-Precision Instrument (NPI) (global positioning system [GPS]) capabilities
- Surfacing the entire facility with crushed aggregate surface course
- Providing adequate area for snow storage
- Constructing an apron and taxiway system with the required separation distances
- Meeting FAA standards for airspace and compatible land use by acquiring 330 acres of land
- Installing a pilot-operated airport lighting system
- Installing precision approach path indicators (PAPI), runway end identification lighting (REIL), and associated pads
- Installing an automated weather observation system (AWOS) pad
- Increasing the number of snow removal equipment storage building (SREB) bays to two
- Extending the overhead electrical line to the new facility

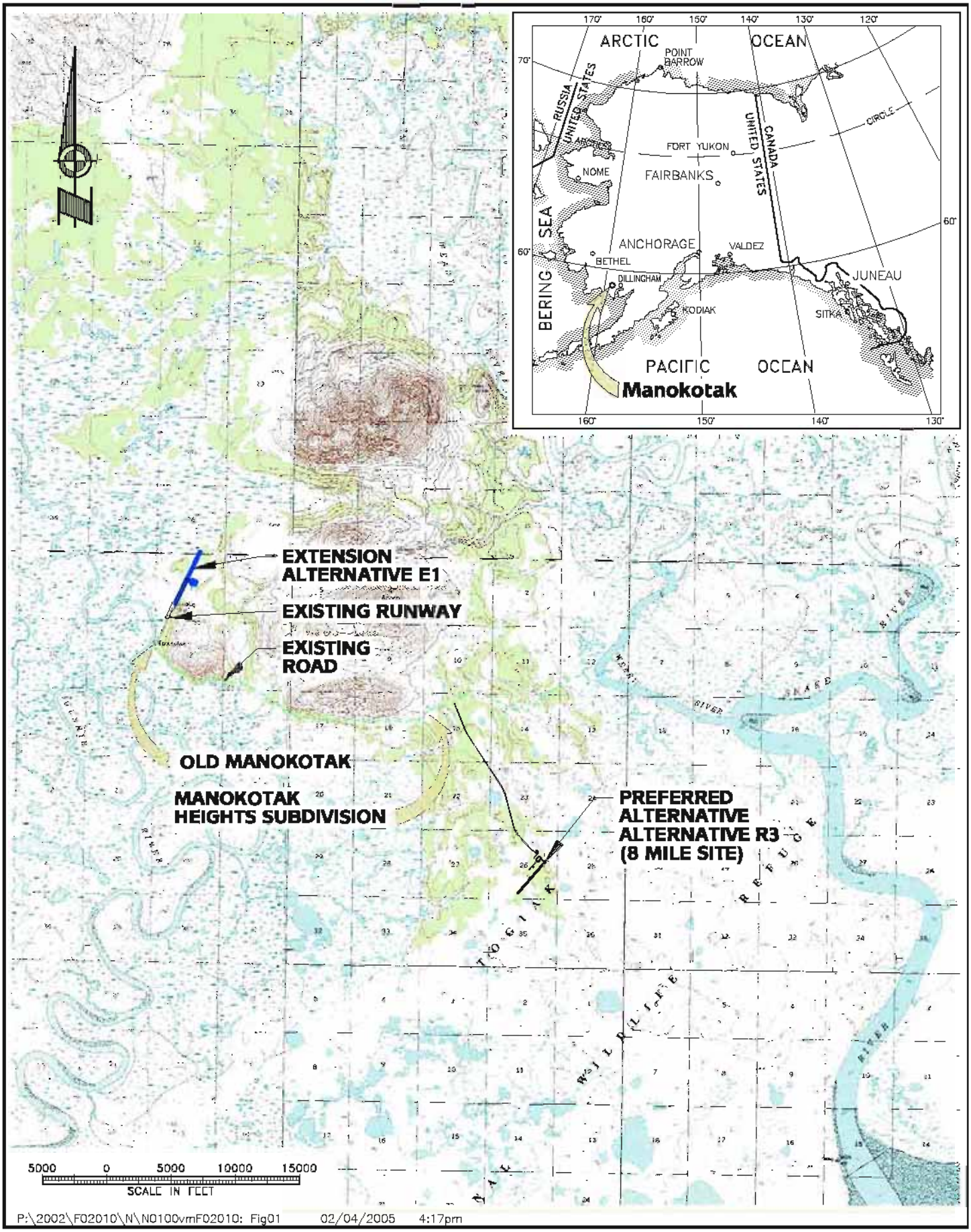
This Environmental Assessment (EA) presents two proposed build alternatives (Alternatives E1, expansion, and R3, relocation) and the No-Build Alternative (all described in Section 3). The EA then analyzes and compares the engineering and safety considerations as well as the potential environmental impacts of each (discussed in Section 5). The following matrix was used to identify an engineering preferred alternative. The relative importance of the criteria is included to show where the most emphasis was placed when comparing the alternatives.

Alternative Comparison Matrix					
			Alternatives Being Carried Forward into Environmental Assessment		
Category	**Relative Importance (Higher = more important)**	**Evaluation Criteria**	**Alternative R3 8-Mile Site**	**Alternative E1 Extend Existing**	**No Build Alternative**
SAFETY	20	**Distance from Landfill and Lagoon** *Farther=Better* *FAA requires 10,000'*	12,970' from existing lagoon 14,870' from proposed landfill	4,000' from existing lagoon 4,700' from existing landfill More than 23,000' from proposed landfill	3,000' from existing lagoon 3,800' from existing landfill More than 23,000' from proposed landfill
	13	**Approach Capabilities (Terrain Limitations)** *Big difference for medevac, no significant difference for day to day activity* **MDA (Minimum Descent Altitude)**-*The lowest altitude a plane can fly by instrument alone, before landing.* **MAP (Missed Approach Point)**- *A point at which a plane has to cancel a landing because of poor visibility.* *MDA Lower=Better* *MAP Shorter=Better*	MDA= 700' for NE approach MDA= 600' for SW approach MAP= 1-mile visibility for approaching either end	MDA= 1,060' (visibility of 1.25 statute miles for Category A aircraft and 1.5 statute miles for Category B aircraft) MAP= 1-mile west of airport; due to terrain, a straight-in approach is not viable.	MDA= 1,060' (visibility of 1.25 statute miles for Category A and 1.5 statute miles for Category B aircraft) Due to terrain, a straight in approach is not viable.
	10	**Wind Coverage** *Affects day to day operations* *Higher %=Better* *FAA requires at least 95%*	13 knots = 97.83%, Pilot commented that winds are better farther from the hill	13 knots = 93.62%, Higher overall crosswind and range of winds (no improvement)	13 knots = 93.62%, Higher overall crosswind and range of winds
	7	**Obstructions (for example fuel tanks, properties)**	None	Community and tank farm (distance = 2,950') Armory in Runway Protection Zone (RPZ)	Community and tank farm (distance = 1,970')
GOOD ENGINEERING	20	**Construction Costs**	$10,880,083	$9,401,025	None
	10	**Maintenance & Operations (M&O) Costs** *Considered on a cost per mile basis, including access road. However, according to the ADOT&PF M&O superintendent, the costs of all alternatives will be the same because of wind factors that affect drifting and snow removal.*	20.03 lane miles Minimal snow drifting	15.40 lane miles Snow drifting	8 lane miles (existing) Snow drifting
	5	**Geology / Long-Term Stability**	Decent soil conditions - uniform, relatively flat terrain, all fill section	Unfavorable soil conditions; more than 12' of peat - will continue to consolidate over time	Existing facility decent; soft and muddy surface during spring breakup or heavy rains and shallow ponding along the centerline after rain
	5	**Future Expansion Possibilities**	No readily apparent concerns	Limited by subsurface and terrain Limits community expansion	Limited by subsurface and terrain Limits community expansion

Alternative Comparison Matrix					
			Alternatives Being Carried Forward into Environmental Assessment		
Category	Relative Importance (Higher = more important)	Evaluation Criteria	Alternative R3 8-Mile Site	Alternative E1 Extend Existing	No Build Alternative
ENVIRONMENTAL IMPACTS	10	**Convenience of Access/ Proximity to Community**	Additional 3.9 miles beyond Manokotak Heights Community concerns with road closure	Close to clinic and main population	Closest to clinic and main population
	8	**Wetlands**	No impact	Entire extension in wetlands	No impact
	7	**Costs to Users**	Increased commuter costs from Old Manokotak (distance= 7.9 miles)	Similar to current; longer access road means possible higher commuter cost	No change
	5	**Land Acquisition**	No relocations; 330 acres of property to be acquired from one landowner	One residential relocation; 63 acres of property to be acquired	No additional land needed; reduced RPZ and existing homes within approach

Based on further analysis, Alternative R3 has been selected as the Preferred Alternative. The features of Alternative R3 include:

- 3,300-foot by 75-foot runway with 3,900-foot by 150-foot safety area
- 250-foot by 400-foot apron with adjacent lease lots and tie-downs on the northwest side of the runway
- A 2.7-mile access road
- Medium intensity runway and taxiway lighting system
- Segmented circle, lighted wind cone, rotating beacon, PAPI, REIL, and associated pads
- Pad for future installation of AWOS
- 2-bay SREB and pad
- 330 acres of land to support aviation use
- Overhead electrical line to the airport



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PLANS DEVELOPED BY:
PDC, INC.

LOCATION & VICINITY MAPS
MANOKOTAK AIRPORT RELOCATION

MANOKOTAK, ALASKA

DESIGN:	
DRAWN: CFP / GDS	
CHECK: RLC	
Feb 2005	

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F02010
FIGURE
1

2.0 PURPOSE AND NEED

The purpose of the proposed project is to provide the residents of Manokotak with a safe, reliable facility that both meets their present year-round transportation needs and has the capability to expand to meet their future needs.

The community of Manokotak uses the airport for transport of supplies and mail; for passenger travel, business, and inter-village activities; and for medevacs. Air travel is the only year-round lifeline linking Manokotak to other communities and supplying the residents with passenger service, food, supplies, and medicines. No roads connect Manokotak with other communities. A snow-machine trail to Dillingham and Twin Hills is only usable during the winter. Barge service is provided along the Igushik and Weary Rivers during the ice-free months, and local transportation is available by skiffs and snow-machines. These modes of river transportation are often unusable, especially during spring break-up and during the fall before the ice thickens sufficiently.

Improvements to the Manokotak Airport are needed to correct potential safety concerns. Existing conditions at Manokotak Airport fail to meet current FAA standards and the State of Alaska's established requirements for community airports with NPI approach capabilities (described in Section 2.1.2). These deficiencies include:

- Runway too short and too narrow
- Runway safety area too narrow
- Taxiway and taxiway safety area too narrow
- Substandard separation distance between runway and aircraft parking area
- Runway surface in poor condition
- Poor drainage, especially in spring when snow berms along the runway are melting
- Terrain penetrations
- Bulk fuel storage facility, gas station, antenna, and residences along the approach
- Crosswind problems due to runway alignment relative to the local prevailing winds
- Inadequate snow storage area, resulting in snow berms penetrating the airspace
- Lagoon and landfill too close to the south end of the runway
- Inadequate clearance of transitional surface by access road and vehicles

A short runway with poor surfacing combined with poor weather results in the inability to provide reliable service to the residents of this community. The U.S. Flight Publication (Appendix B, Alaska Supplement) notes that the runway has a soft and muddy surface during spring breakup or heavy rains and shallow ponding along the centerline after rain, and recommends that pilots visually inspect the runway prior to landing. Drainage and snow drifting problems occasionally cause partial or complete airport closures.

The need for improvement is further demonstrated when considering that the airport is vital to providing emergency services to Manokotak. Between 25 and 30 medevacs are flown each year. According to one air service provider, about half of these medevac operations occur at night in poor weather conditions. Several airplane accidents have occurred in the area; at least one resulted from turbulent winds caused by the surrounding hills. The medevac providers estimate there are at least 60 days per year with Instrument Flight Rules (IFR) weather conditions and about 35 days per year

when medevac flights cannot get into Manokotak at all. One pilot feels the 35 days could be reduced considerably by relocating the runway to the other side of the mountain (see Appendix A, Questionnaires and Telephone Log).

Relevant issues supporting the project's purpose and need were identified early in the scoping process. Methods used to identify these issues included personal telephone conversations, public and agency meetings, a community questionnaire, visits to the existing airport facility and alternative sites, and correspondence with air carriers and agencies. Appendix A provides documentation of these coordination efforts, including minutes of the public and agency meetings.

In a survey of Manokotak residents, respondents generally (20 out of 29) reported having no problems accessing the airport; most people that reported access problems experienced them during the winter. Respondents receive most of their supplies by air, although many people reported they also receive supplies by barge in the summer months. All stated they would use air transportation more frequently if available. The majority of people take more than 24 trips per year (by air) outside of Manokotak. Their concerns with traveling to and from Manokotak were primarily related to bad weather, wind, and airport safety.

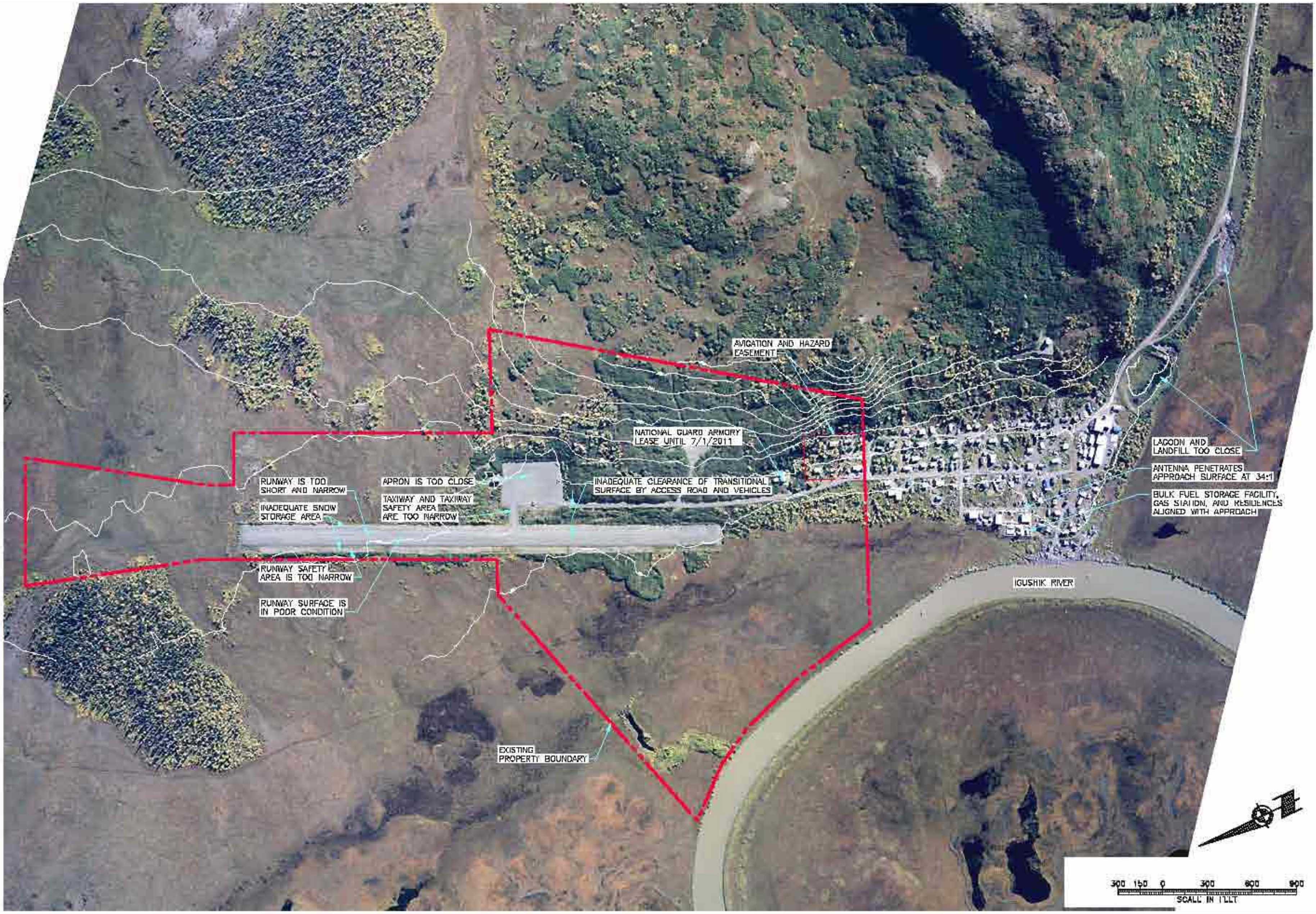
A questionnaire was sent to pilots early in the project to determine their concerns and needs. All pilots responding to a question about crosswinds considered them a problem at Manokotak. Some pilots report that the crosswinds determine their approach at Manokotak. Pilots also expressed concerns about terrain. Reported landing difficulties were associated with wind, weather, and the lack of drainage on the runway surface.

2.1 Airport Facilities

2.1.1 Existing Airport Facilities

Manokotak Airport (Figure 2) consists of a single gravel runway (2,720 feet by 60 feet; safety area 3,200 feet by 120 feet) with a 200-foot taxiway connecting the runway to a 200-foot by 400-foot aircraft parking apron. A one-bay SREB stands next to the apron. Medium Intensity Runway Lights (MIRL) mark the edges of the airport facility. Other navigational aids include a rotating beacon on top of the SREB and two windsocks, one lit and one unlit. The airport was last improved in 1986, and only routine maintenance has been completed since that time.

The runway, taxiway, and associated safety areas do not meet the standards required for a number of the aircraft currently operating at the airport, especially the medevac aircraft that provide the village's only link to advanced health care facilities in Dillingham and Anchorage. Because of the facility deficiencies and limitations imposed by the surrounding terrain, the airport does not support operations during inclement weather. The existing site is often fogged in, causing further closures. The apron separation distance and the runway protection zone meet only the lowest airport classification. The U.S. Flight Publication (Appendix B, Alaska Supplement) warns pilots that the runway surface is soft and muddy during spring breakup and heavy rains.



PLANS DEVELOPED BY:
PDC, INC.

MANOKOTAK AIRPORT RUNWAY RELOCATION
EXISTING CONDITIONS
MANOKOTAK, ALASKA

DESIGN:	KBK/SRL
DRAWN:	GDS
CHECK:	RLC

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Photo 1 – Existing Airport with Adjacent Hill

Constraints at the airport involve airspace penetrations and obstructions. A bulk fuel storage facility, gas station, residences, and an antenna are within the departure/approach path. This is cause for concern on landings and takeoffs. The bulk fuel farm is located approximately 1,900 feet from the edge of the existing runway and has a gas station next to it. The community has identified the runway's alignment with the bulk fuel storage facility as a concern in their Emergency Disaster Plan (see Appendix B). The bulk fuel facility is only 100 feet from the Manokotak Power Company's generators and 90 feet from the nearest residence. The antenna, located 1,900 feet out from and 100 feet to the right of the runway end, extends 65 feet above runway elevation.

The U.S. Flight Publication (Appendix B, Alaska Supplement) warns of "sharply rising terrain," referring to an 800-foot hill next to the runway which penetrates the airspace (Photo 1). These terrain obstructions result in fairly high approach minimums. The current GPS approach is 1,100 feet minimum descent altitude (MDA) and the missed approach point (MAP) is 2 miles. Besides presenting an obstruction, the proximity of the hill creates wind gusts and crosswinds on the runway. Wind is a critical component in determining the alignment of a runway because crosswinds often contribute to accidents.

The lack of adequate snow storage results in snow berms that rise above the primary surface; drainage and snow drifting problems often cause partial or complete airport closures. The airport lies crosswind to the high winter winds; this, combined with the snow coming off the adjacent hillside, makes snow drifting prevalent. These conditions require the snow to be pushed off the west side of the runway, leaving a snow berm that penetrates the airspace and narrows the landing surface. The snow removal process requires substantial time, effort, and cost to keep the runway clear and creates a potential safety concern. In addition, in the spring the berm acts as a dam, holding the meltwater on the runway surface. This saturates the runway, causing unstable conditions that lead to airport closures.

Both the village sewage lagoon and the landfill are closer than the standards established by the FAA for safety. The separation distance is a safety standard set to reduce aircraft collisions with wildlife.

There is an access road adjacent to the runway. The road does not have the required 15-foot clearance below the transitional surface. According to the Airport Layout Plan (ALP), there is between 3 feet to 9 feet of clearance; thus, vehicles traveling on the access road penetrate the transitional surface at some locations.

The short runway, deteriorated runway surface, airspace penetrations, and inadequate separation distances combine to hinder safe operations at the airport. In addition, the airport does not support NPI approach because there is no way to achieve 95% wind coverage; the mountain next to the runway is an obstruction, and the approach cannot be cleared because of the village location. Establishing an NPI approach would improve accessibility and increase safety during inclement weather.

2.1.2 Facility Requirements

The Cessna 208 Caravan has been selected as the design aircraft. The Caravan is the most demanding aircraft that frequently operates at Manokotak and its selection as the design aircraft is further supported by the *Southwest Alaska Transportation Plan* (*SAT Plan;* Parsons Brinkerhoff, 2002). The Alaska Aviation Coordination Council recommends a 3,300-foot runway for rural public airports to support all-weather approach and landing capacity.

Table 1 compares the existing facility dimensions with those required to meet the A/B-II standards. The deficiencies illustrate the extent of the facility needs.

Table 1 – Facility Deficiencies and Requirements

Feature	Existing Facility	Facility Requirements	Deficiency
Runway Length	2,720’	3,300’	580’
Runway Width	60’	75’	15’
Runway Safety Area Width	120’	150’	30’
Taxiway Width	25’	50’[1]	25’
Taxiway Safety Area Width	50’	118’[1]	68’
Aircraft Parking Area	200’ x 400’	100,000 SF[2]	None
Aviation Support Area	4 lots – 100’ x 100’	4 lots – 100’ x 100’	None
Aircraft Parking Area Separation	200’	400’	200’
Runway Lighting	MIRL	MIRL	None

[1] Taxiway and Taxiway Safety Area widths are increased to the next higher Aircraft Design Group (III) to provide more snow storage area and to allow occasional use by larger aircraft.
[2] Proposed dimensions; these features have no requirements.

2.1.3 Airport Activity Data

Historic and Current Activity

The majority of passengers, air freight, and all mail to and from Manokotak pass through Dillingham Airport (the regional hub), where passengers either stay or transfer to carriers providing service to Anchorage or other destinations. Although Manokotak is serviced by a number of daily flights, most air carriers serve Manokotak “on demand” and as a “flag stop” to and from other scheduled service destinations. Medevac flights typically originate in Dillingham, with patients being transported back to Dillingham for treatment at Kanakanak Hospital. More severe cases result in transport from Dillingham to Anchorage.

Pilots identified the following aircraft (Table 2) as those they typically fly to Manokotak.

Table 2 – Current Aircraft Fleet Mix

Aircraft	ARC Designation	Aircraft Use
Cessna 172 Piper PA28 Cherokee	A-I	General Aviation
Cessna 206 and 207 Piper PA32 Saratoga	A-I	Air Taxi & Charter
Cessna 208 Caravan	A-II	Air Taxi
Piper PA31 Navajo	B-I	Air Taxi & Medevac

For un-towered, rural airports such as Manokotak Airport, data is limited to current and past operations and enplanements, as reported by airport users.

The FAA Master Record (dated September 4, 2003) lists 1,000 air taxi operations and 200 general aviation itinerant operations for a total of 1,200 operations. However, the source of this data appears to be inaccurate. Pen Air and Bristol Bay Air, the two main carriers into Manokotak, reported a combined total of 4,100 air taxi operations for 2002. These 4,100 operations, combined with the 200 general aviation itinerant operations reported by FAA (the only available source), yield a total of 4,300 annual operations. This number was used as the basis of the aviation forecast below.

Aviation Forecast

Forecast elements were based on current aviation activity at the airport and demographic patterns (PDC, 2004). In 2022, Manokotak Airport could experience up to 5,814 annual operations. The A/B-II facility with a single 3,300-foot runway is expected to meet the forecasted demand through 2022 because:

- Manokotak's population is not expected to change substantially
- Changes in economic factors that would affect the facility requirements are not anticipated
- Flights on smaller planes would likely continue to serve on a "demand" basis

2.2 Identification of Federal Action

The Federal actions requested by ADOT&PF are approval of the ALP and participation in funding the improvements described herein.

3.0 ALTERNATIVES

Alternatives were developed through the evaluation of environmental and engineering factors. Topographic and land use constraints limited alternative development at the site of the existing airport. Expansion of the existing airport and potential relocation options were initially evaluated by reviewing U.S. Geological Survey (USGS) topographical maps, aerial photography, and community input. Relocation was considered because expansion at the existing site would present the following challenges:

- An extension of the existing runway would be expensive and could be unstable due to organic soils
- An extension would affect higher value wetlands
- Upgrade to provide for Non-Precision Instrument (NPI) approach capabilities increases obstruction by the adjacent hill
- The armory, fuel tanks, and homes would continue to obstruct the airspace
- The inadequate distance from the sewage lagoon and landfill would not be addressed
- Problems with crosswinds, snow removal, and snow storage would not be remedied
- Future expansion of the airport, if needed, would not be easily accommodated
- Land for community expansion near the original town site would remain unavailable due to conflicts with the airport use

Alternatives E1, R3, and the No-Build Alternative (Figure 3) remain for consideration in this EA. Alternative E1 would extend the existing runway in its current location, and Alternative R3 would relocate the airport southeast of the Manokotak Heights subdivision. The No-Build Alternative consists of the existing facility with no changes.

The potential environmental impacts of each alternative are discussed in Section 5, Environmental Consequences. Neither build alternative would have substantial impacts. Public comments have been received in support of both build alternatives. In general, Alternative R3 meets the community's needs and FAA safety standards. Alternative E1 would not fully address FAA safety deficiencies. The existing deficiencies and substandard conditions (as described in Section 2.1.2 above) would remain under the No-Build Alternative. Thus, Alternative R3 has been selected as the Preferred Alternative.

3.1 Alternative R3 (8-Mile Site) – Preferred Alternative

Description

Alternative R3 (Figure 4) would relocate the airport runway 2.5 miles southeast of Manokotak Heights Subdivision and 7.5 road miles from Old Manokotak. The runway would be oriented at 41 degrees, the optimum orientation for wind coverage. The apron and taxiway would be placed on the east side of the runway. The airport access road would connect with the Weary River Access Road just east of the subdivision.

Features of Alternative R3 include:

- 3,300-foot by 75-foot runway with 3,900-foot by 150-foot safety area

- 250-foot by 400-foot apron with adjacent lease lots and tie-downs on the northwest side of the runway
- A 2.7-mile access road
- Medium intensity runway and taxiway lighting system
- Segmented circle, lighted wind cone, rotating beacon, precision approach path indicators (PAPI), runway end identification lighting (REIL), and associated pads
- Pad for future installation of Automated Weather Observation System (AWOS)
- 2-bay SREB and pad
- 330 acres of land to support aviation use
- Overhead electrical line to the airport

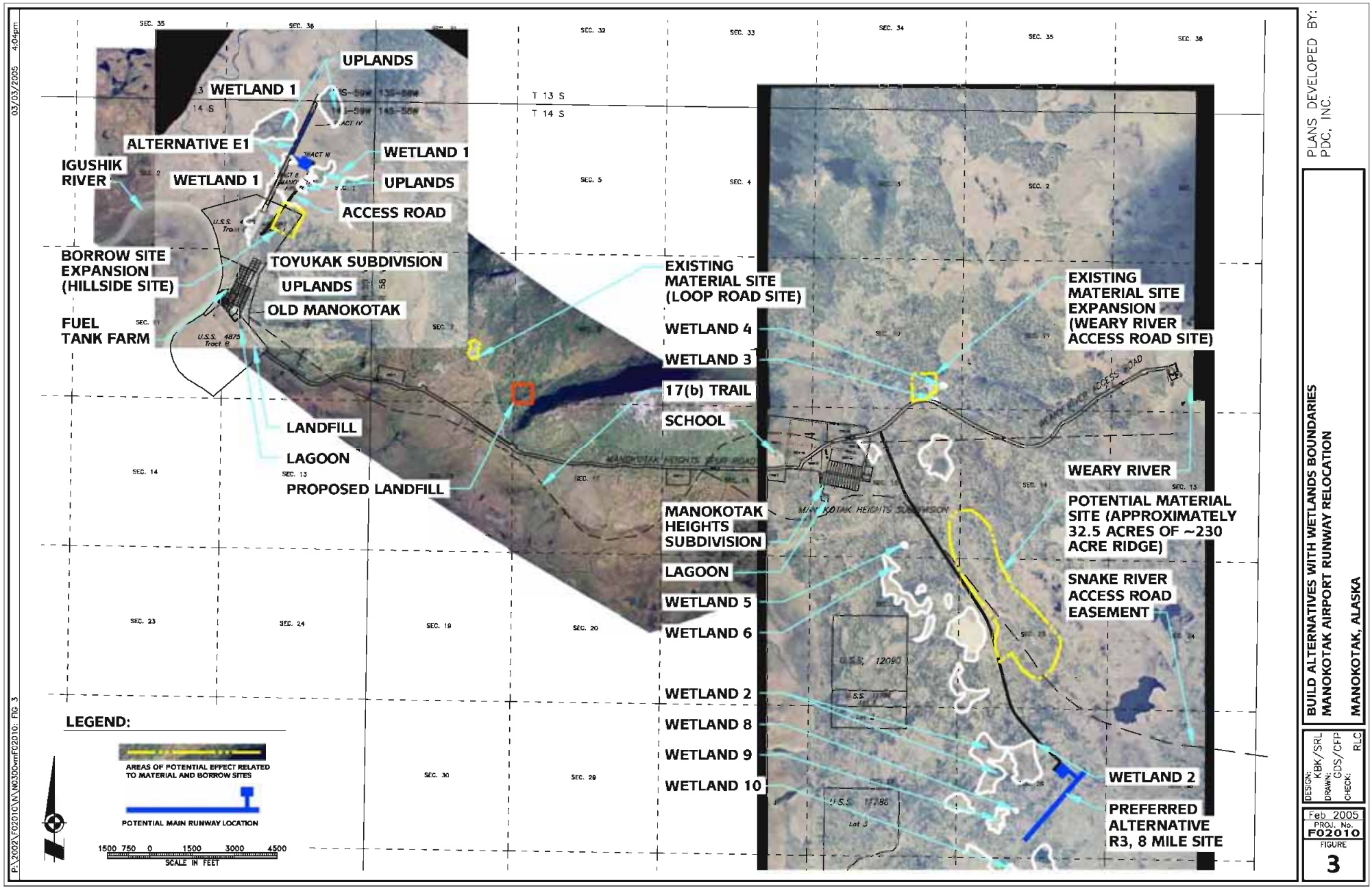
The airport facilities (runway, taxiway, apron, pads, and access road) embankment would consist of borrow material (approximately 270,000 cubic yards). The material will likely come from excavation from the development of the proposed Ridge material site. Approximately 40,000 cubic yards of surface course is likely to come from expansion of the Weary River Access Road site or from within the existing unvegetated floor of the Loop Road material site. An estimated 82,000 cubic yards of subbase material is likely to come from the Ridge or Weary River Access Road material sites. If the contractor chooses to obtain material from the Ridge site, he would be required to grade it to drain and avoid ponding due to the proximity to the proposed airport site. Although penetration of the water table is not expected, excavation below it in any material site would be backfilled with overburden or unusable excavated material to a height of 2 feet above the water table to eliminate ponding.

Approximately 330 acres of property would be required for construction of the new runway, taxiway, and apron, as well as for clearing trees from the airspace.

In addition to the features discussed above, Alternative R3 would require decommissioning of the existing airport facility, including disposal of the existing SREB. Some of the existing airport land may eventually revert to the City and the Bristol Bay Native Corporation (BBNC).

Functional Analysis and Engineering Considerations

- Meets FAA airport design standards to provide a safe facility
- Has no airspace penetrations
- Allows for development of optimal NPI approaches
- Offers 97.8% wind coverage with a 13-knot crosswind component
- Would cost approximately $10,300,000 to construct
- Has annual maintenance and operation (M&O) costs (using lane-mile analysis) estimated at $139,800, comparable to those at the existing airport
- Places the airport on soils well suited for construction
- Meets needs of community and airport users
- Provides pilot-operated lighting to increase the hours of operation
- Has no buildings located in the Runway Protection Zone (RPZ)
- Meets recommended separation standards for landfills and lagoons
- Would easily accommodate future expansion



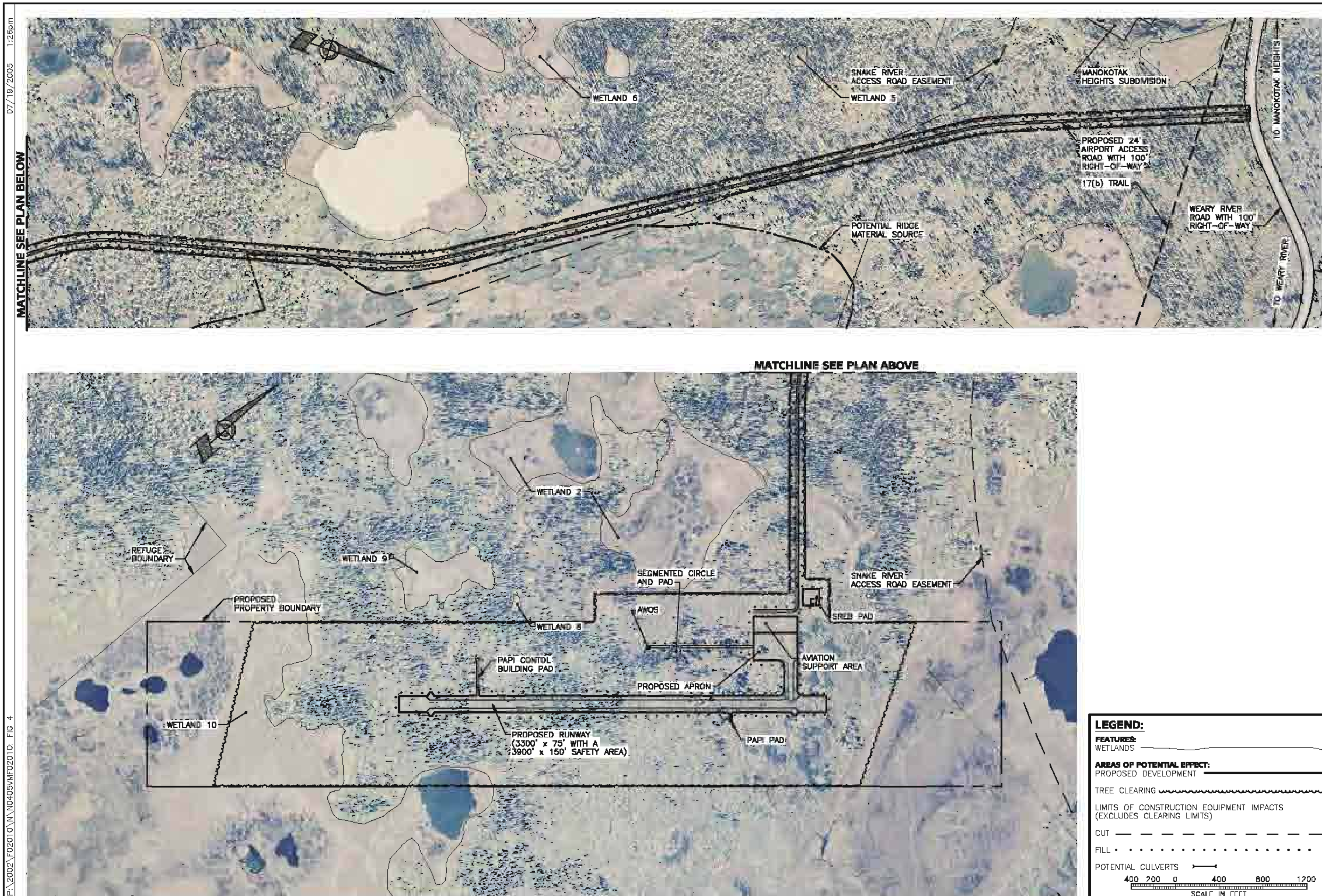
P:\2002\F02010\N\N0300vmF02010: FIG 3 03/03/2005 4:04pm

PLANS DEVELOPED BY:
PDC, INC.

BUILD ALTERNATIVES WITH WETLANDS BOUNDARIES
MANOKOTAK AIRPORT RUNWAY RELOCATION
MANOKOTAK, ALASKA

DESIGN: KBK/SRL
DRAWN: GDS/CFP
CHECK: RLC

Feb 2005
PROJ. No. F02010
FIGURE 3



PLANS DEVELOPED BY:
PDC, INC.

ALTERNATIVE R3 - AREA OF POTENTIAL EFFECT
MANOKOTAK AIRPORT RUNWAY RELOCATION

MANOKOTAK, ALASKA

DESIGN: KBK/SRL
DRAWN: GDS
CHECK: RLC

July 2005
PROJ. No. F02010
FIGURE
4

P:\2002\F02010\N\N0405VMF02010: FIG 4 07/19/2005 1:26pm

Alternative R3 would have no airspace penetrations (see Appendix B, Airspace Drawings). This alternative is located the farthest from nearby hills, providing the best approach minimums of the alternatives considered and the greatest chance of getting in/out during IFR weather. The Bristol Bay Air Service owner, who reports the majority of the operations and enplanements for Manokotak, has indicated that Alternative R3 "would provide a much safer option to landing and taking off in bad weather." (See Appendix A, Questionnaires and Comments.)

FAA's analysis of airspace requirements for instrument approaches at R3 indicated:

- NE runway end: Straight in, 700-foot Minimum Descent Altitude (MDA)
- SW runway end: Straight in, 600-foot MDA
- For both runway ends: 1-mile visibility with the Missed Approach Point (MAP) at the threshold

The proposed runway is orientated at 41 degrees to obtain the optimum wind coverage, 97.8%. The wind data indicates the higher winds are predominantly from the northeast. In addition, the high winds in the winter months (November to March) when snow drifting is an issue generally come from the northeast and southwest. The wind data figures provided in Appendix B show that winds at R3 are less intense and from a more consistent direction than at the existing airport site.

Winter snow storage and drainage would be improved by constructing the embankment above the surrounding terrain. Aligning the runway optimally with the wind would improve plow-time and storage requirements, since the snow could be plowed off both sides of the runway. Although this relocation option would have the longest access road to maintain, the runway is aligned optimally with the wind. Since the runway would be all fill, there would be minimal snow drifting. This would also reduce plowing time and M&O costs.

The reconnaissance-level geotechnical investigation identified the subsurface soil at the Alternative R3 site to be moist silts with 3 to 6 feet of overburden. The terrain is flat, allowing for an "all fill" construction of the runway, taxiway, and apron. The geotechnical engineer recommended a minimum 4-foot fill section to be placed directly over the existing tundra. Because of the organic mat and overburden material, some initial settlement (6 inches) should be expected, but the majority of the settlement should be immediate and uniform. Because a fairly uniform embankment depth can be placed over this area, very minor differential settlement would be expected in the long term.

Changes Since Agency Scoping

Since the February 20, 2004, agency scoping letter, refined topography and geotechnical information became available. This information allowed refinement of the airport design to avoid wetland impacts. The runway, taxiway, and apron were shifted to the east, and the road alignment was adjusted. The airport property boundary was also increased to protect the airport from future incompatible land uses.

3.2 Alternative E1

Description

Alternative E1 proposes to extend the north end of the existing runway to the required runway length (Figure 5). Extension off this end is the only reasonable option at this site. The south threshold would shift 975 feet north so that the RPZ does not encompass the residential properties in Toyukak Subdivision at the south end of the runway. The runway would remain oriented at 26 degrees. Existing

residences, the bulk fuel storage facility, the gas station, and the antenna would continue to lie in the approach at the south end. The access road would be lengthened, and the apron would be relocated to the required separation distance for safety. The segmented circle and wind cone would also be relocated.

Because of the surrounding terrain, Alternative E1 cannot be aligned to achieve 95% wind coverage with a 13-knot crosswind tolerance; 93% is the best that could be achieved through realignment. Widening the runway to 100 feet (ARC B-III), which would give pilots more room to maneuver when landing in a crosswind, would increase the crosswind tolerance to 16 knots, thus improving the overall wind coverage to 97.5%.

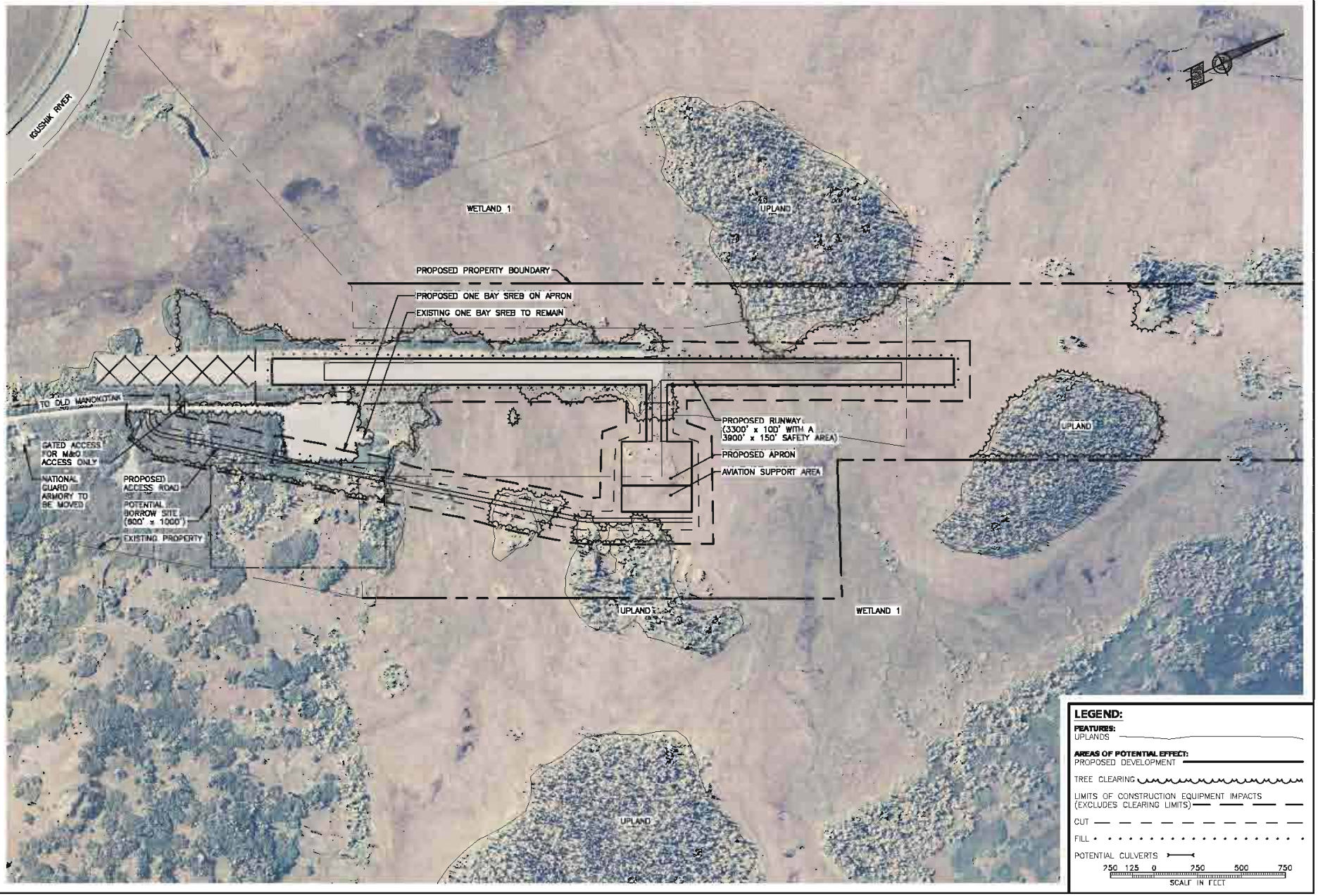
Alternative E1 would expand the existing airport to include:

- Runway lengthened 580 feet and widened 40 feet to provide a 3,300-foot by 100-foot runway with a 3,900-foot by 150-foot safety area
- Apron (250 feet by 400 feet) and taxiway relocated to meet separation requirements
- Access road extended 3,300 feet to new apron
- PAPI, REIL, and AWOS pads constructed for future FAA installation
- Additional 1-bay SREB
- Approximately 63 additional acres of airport property

Functional Analysis and Engineering Considerations

- Meets FAA airport dimensional design standards but has airspace obstructions
- Allows NPI approaches (with very limited approach minimums):
  - No viable straight in approach
  - MDA of 1,060 feet
  - Visibility of 1.25 statute miles for Category A aircraft and 1.5 statute miles for Category B aircraft
  - MAP at 1 mile west
- Offers 97.5% wind coverage (16-knot crosswind component), meeting FAA crosswind requirements
- Would cost approximately $8,510,000 to construct
- Has annual M&O costs (using lane-mile analysis) estimated at $104,600, comparable to those at the existing airport
- Requires substantial material to surcharge because of poor subsurface conditions
- May not be as stable in the long term
- Provides pilot-operated lighting to increase the hours of operation
- Requires relocation of a building to clear the RPZ
- Remains too close to lagoon and current landfill
- Retains bulk fuel storage facility, gas station, and residences in line with approach

As previously noted, the existing airport site has terrain limitations. The initial airspace drawing shows minor penetrations of the approach and transitional surfaces and substantial airspace penetrations (approximately 3,000 acres) of the horizontal and conical surfaces (Appendix B, Airspace Drawings). FAA completed an analysis of the effects of these airspace obstructions on developing an instrument approach. The analysis indicates that due to terrain, only a very limited NPI approach can be achieved (as listed above).



LEGEND:

FEATURES:
UPLANDS

AREAS OF POTENTIAL EFFECT:
PROPOSED DEVELOPMENT
TREE CLEARING
LIMITS OF CONSTRUCTION EQUIPMENT IMPACTS (EXCLUDES CLEARING LIMITS)
CUT
FILL
POTENTIAL CULVERTS

750 125 0 250 500 750
SCALE IN FEET

PLANS DEVELOPED BY:
PDC, INC.

ALTERNATIVE E1 - AREA OF POTENTIAL EFFECT
MANOKOTAK AIRPORT RUNWAY RELOCATION

MANOKOTAK, ALASKA

DESIGN: KBK/SRL
DRAWN: GDS
CHECK: RLC

Feb 2005
PROJ. No.
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FIGURE
5

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P:\2002\F02010\N\N0405VMF02010: FIG 5

For day-to-day operations, this may only pose inconveniences such as late mail or delays in passenger travel. However, in the case of a medical emergency these high approach minimums could mean life or death. Either the plane cannot get in to reach the patient, or the pilot takes risks, flying beyond the limits of the approach minimums to reach and evacuate the patient. Local pilots report up to 60 days per year of weather requiring instrument procedures and 25-30 annual medical emergencies.

The runway would be oriented at 26 degrees. This is 25 degrees off from optimum, so wind coverage at this alternative is only 93.6% for the 13-knot crosswind component. Crosswinds at this site are strong and variable and cause difficulties with landing and snow drifting. At locations where provision of a crosswind runway is impractical due to severe terrain, FAA guidance allows for increasing the operational tolerance to crosswinds by upgrading the airport layout to the next higher airport reference code. Increasing the runway width from 75 to 100 feet allows a 16-knot crosswind component to be used, improving the coverage from 93.6% (at 13 knots) to 97.5% at the orientation of 26 degrees. In general, the winds at E1 were found to be more intense and more variable than at R3. (See Appendix B, Wind Data Figures.)

Initially, in preparing the cost analysis, it was thought that the shorter access road would make the maintenance costs at Alternative E1 less expensive than R3. However, this alternative lies crosswind (25 degrees) to the high winter winds; combined with the snow coming off the adjacent hillside, this makes snow drifting more prevalent. These conditions would require the snow to be pushed off the west side of the runway, as is done on the existing airport, leaving a snow berm that penetrates the airspace and narrows the landing surface. The snow removal process requires substantially more effort to keep the runway clear. Thus, the M&O cost for Alternative E1 is expected to be similar to that at R3.

The reconnaissance-level geotechnical investigation identified up to 14 feet of peat off the north end of the existing runway. Because the peat would consolidate up to 60% (~6 feet), a 15-foot embankment thickness would be needed for surcharge areas and left for at least 5 months to complete the consolidation of the underlying peat. A geotextile-lined bottom would be needed for reinforcement. Some long-term consolidation would continue over time. The soil conditions increase the cost of this alternative to be comparable to that of the relocation alternative, R3.

A publicly owned National Guard Armory would be within the RPZ. FAA Advisory Circular (AC) 150/5300-13, para. 212(2)(a), prohibits places of public assembly from being within the RPZ. This building and its operations would need to be relocated as part of this build alternative.

3.3 No-Build Alternative

Description

The No-Build Alternative (Figure 2) would result in no appreciable improvements at the existing airport. Minor improvements might be made through expenditure of M&O funds, but reconstruction would not occur. Selection of this alternative would result in zero expenditure of federal funds.

Functional Analysis and Engineering Considerations

The primary disadvantages of the No-Build Alternative are the continuation of the deficiencies described in Section 2, Purpose and Need. The restriction on the types of aircraft that can operate at Manokotak Airport and the safety concerns would remain because of:

- Failure to meet FAA or State minimum standards for airports in rural Alaska
- Substandard runway dimensions and apron separation distance
- Substandard taxiway dimensions
- Penetrations of the airspace by terrain, snow berms, access roads and vehicles, National Guard Armory building, and an antenna
- Airspace penetrations would remain, limiting GPS approach to 1,100-foot MDA and 2-mile MAP
- No construction cost
- Potential increase in M&O costs as facility deteriorates
- Crosswinds affecting day-to-day operations
- Wind coverage of 88% with a 10.5-knot crosswind tolerance
- Poor drainage affecting runway surface conditions
- Lagoon and landfill too close to the runway
- Bulk fuel storage facility, gas station, and residences on the southern approach

3.4 Eliminated Alternatives

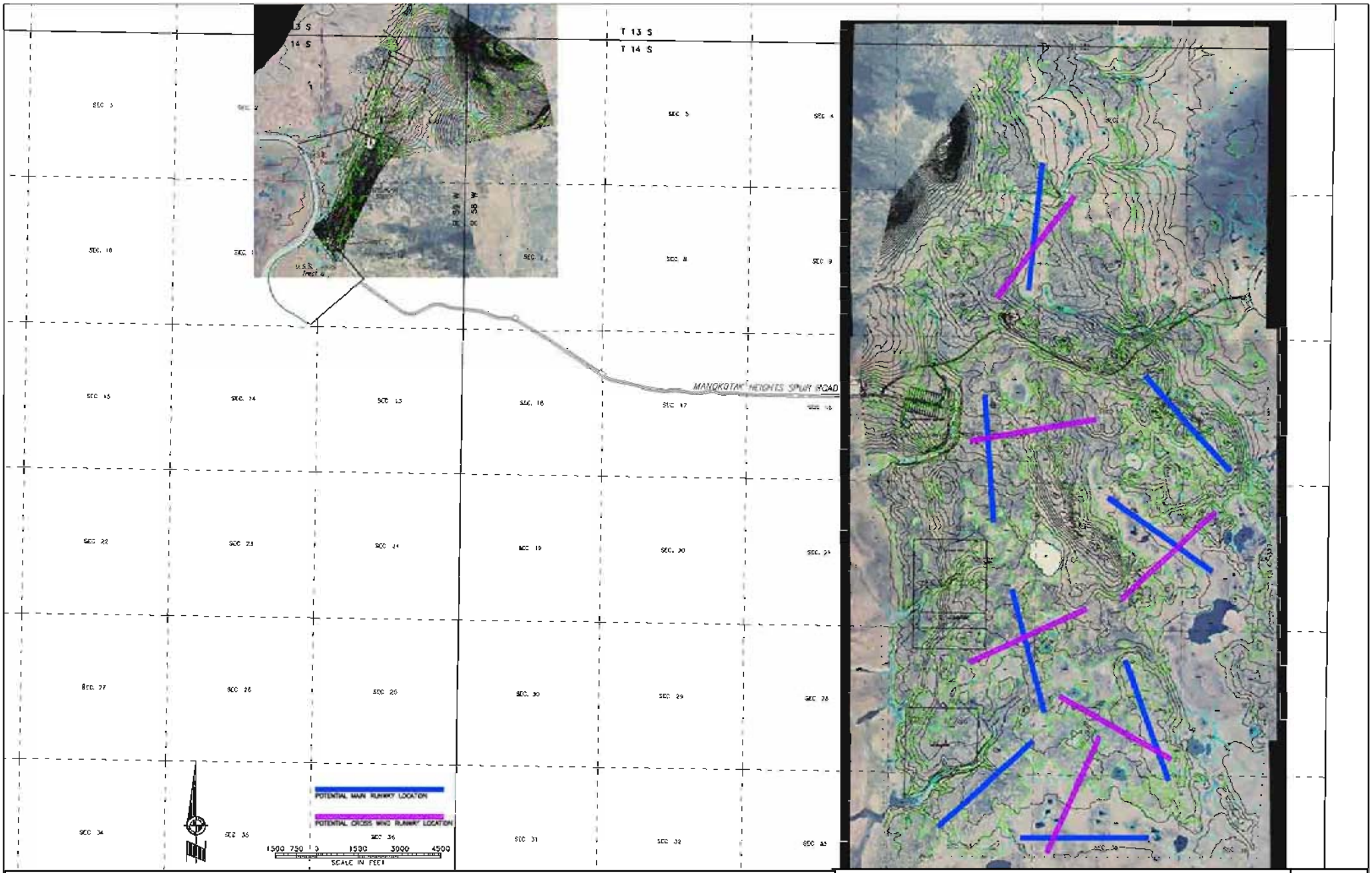
During the preliminary stages of development, eight concept alternatives for relocation were identified (Figure 6). Expanding the existing airport was considered to be a viable alternative. However, removing all of the obstructions was not considered viable due to cost and impact to the community. An initial evaluation was completed, and options with less desirable conditions were dropped. Upon receiving three-quarter-year wind data, the remaining alternatives (Figure 7) were refined and reviewed in greater detail. A full discussion of alternative development and the elimination process is presented in Appendix C. Following is the summary for each eliminated alternative, in the order of elimination.

Alternative E2 was considered not substantially better than E1. The only gain was an additional 3% to wind coverage. E2 involved more wetlands, reused less of the existing site, and required more construction over poor ground, causing higher cost and a less stable facility.

Alternative R2 was eliminated because it offered only 92% wind coverage; required acquisition of land in Native Allotment US 12090; impacted more wetlands; and allowed only limited apron expansion without still greater wetlands impacts.

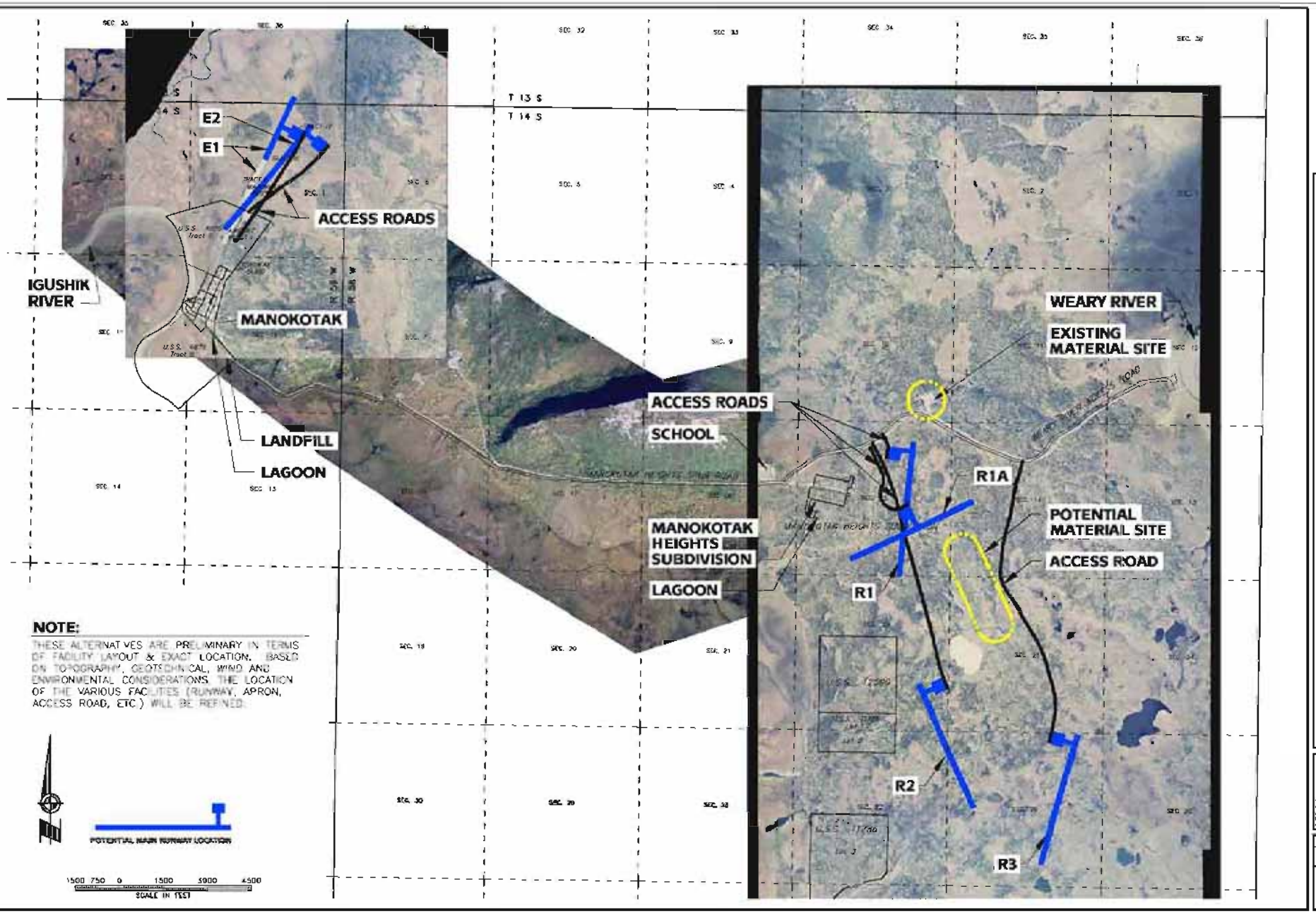
Alternative R1 was eliminated because it was oriented crosswind to the winter winds.

Alternative R1A (5-Mile Site) was analyzed along with Alternatives E1, R3, and the No-Build and eliminated during selection of an engineering preferred alternative (PDC, 2004). Thus, this alternative went through significantly more detailed analysis than the previous eliminated alternatives. Alternative R1A proposed a runway located 5.3 miles from Old Manokotak along the road and east of Manokotak Heights. Airport access would have come off the Weary River Road, approximately 2/3 mile east of the intersection with the road to Manokotak Heights. The apron would have been placed on the west side of the runway, nearest to the direction of access to reduce the potential for runway crossings. The key reasons for eliminating Alternative R1A were its proximity to the lagoon at Manokotak Heights Subdivision and the lack of community support.



EIGHT PRELIMINARY RELOCATION ALTERNATIVES
MANOKOTAK AIRPORT RELOCATION
MANOKOTAK, ALASKA

FIGURE
6



PLANS DEVELOPED BY:
PDC, INC.

FIVE PRELIMINARY ALTERNATIVES
MANOKOTAK AIRPORT RELOCATION
MANOKOTAK, ALASKA

DESIGN: EJC
DRAWN: GDS/CFP
CHECK: RLC

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FIGURE
7

4.0 AFFECTED ENVIRONMENT

4.1 Climate

Manokotak is located in a climatic transition zone. The primary influence is maritime, although arctic climate also affects the region. Average summer temperatures range from 40ºF to 70ºF; winter temperatures average from 4ºF to 30ºF. Annual precipitation ranges from 20 to 26 inches. Low clouds and high winds occur periodically throughout the year. The Igushik River is ice-free from June through mid-November.

4.2 Geology, Soils, and Topography

4.2.1 General

Manokotak lies on the Bristol Bay lowland, a moraine and outwash mantled plain, formerly covered by glaciers. The area around Manokotak is typically a flat muskeg dotted with lakes, morainal knolls and ridges. Vegetation near the river is composed mainly of sedges, grasses, mosses, and low bushes, and other plants consistent with a wet tundra environment. Inland from the Igushik River, the terrain becomes mostly rolling, with many moraine knolls and ridges interspersed among the muskeg. These areas are mantled with a thick layer of silt blown from the floodplains and hills adjacent to retreating glaciers. These uplands are somewhat better drained and can support cottonwood, white spruce, and the undergrowth typical of these forests.

According to previous reports (ADOT&PF, 1986, and ASCG, 1993), the Dillingham/Manokotak area has been mapped as underlain by isolated masses of permafrost, predominantly fine-grained deposits. Permafrost is usually found either at a considerable depth as relict permafrost or near the surface as lenses of small extent where ground insulation is high or low.

In late summer 2003, ADOT&PF conducted a reconnaissance-level geotechnical investigation.

Existing Airport and Alternative E1

The existing airport facility was considered stable; soils on the northern end consist of peat up to 14 feet deep. The peat would consolidate up to 60% with an initial surcharge applied and some long-term consolidation would continue over time.

Alternative R3

Testing at Alternative R3 site found approximately 3 feet of organics over 7 feet of loess (silt). The loess had a 30% to 56% moisture content and a 3% to 5% organic content in the first 3-5 feet. Under the loess, from 10 to over 15 feet below the ground surface was granular soils (glacial till or sand/gravel).

4.2.2 Potential Material Sources

It is expected that the contractor would obtain material from the most cost-effective of the identified sites (shown on Figure 3), depending on which alternative is developed. The Ridge site is an undeveloped source nearest to Alternative R3. The Weary River Access Road site was developed for the construction of the Weary River Access Road and can be expanded; it is the next closest source to Alternative R3. The Loop Road site is already developed, and its use is not expected to require lateral expansion. The Hillside site is an existing borrow pit nearest to Alternative E1 that can be expanded.

The Ridge site is composed of glacially deposited materials, including granular materials with variable levels of fines. Overburden was 5 to 7 feet thick, although this varies depending on location; the overburden is thicker between high points along the spine of the ridge. The geotechnical engineer reported that at the south end of the ridge, closer to Alternative R3, the material has a thinner organic layer and may be better for crushing.

Material suitable for crushing was encountered at the Weary River Access Road site.

The quality of the material found at the Ridge site and the Weary River Access Road site is marginal for surface course material. It is likely that the aggregate surface course material would have to come from the existing Loop Road site, approximately two miles from the existing airport. The Loop Road material site located approximately 1.5 miles outside of Old Manokotak is expected to provide good durable crushed material. The investigation found metasedimentary rock suitable for crushing.

The hillside adjacent to the airport was used for embankment material for the previous airport project and would probably be used again for Alternative E1. The hillside is just east of the runway and consists of crushable material with low fines.

Two smaller material sites are located near Alternative R3. An esker area located in the northeast corner of Section 26 contains at least 20 feet of clean gravel with oversize material. This deposit may hold material suitable for crushing. The second site, located in the northeast corner of Section 22, has granular materials near the ground surface with very little overburden. The fines content may limit material use to subbase and unclassified borrow embankment. These areas are not expected to be used by the contractor due to the minimal amount of material that could be drawn from them. If the contractor does wish to use these small sites for material, he would be required to obtain all necessary permits and clearance.

4.3 Fish and Wildlife Resources

There are no federally listed or proposed threatened or endangered species and/or designated or proposed critical habitat areas in the project area. The Togiak National Wildlife Refuge (NWR) surrounds Manokotak. The closest refuge boundary is approximately ½ mile southwest of the Manokotak Heights subdivision. Although not within the refuge, undeveloped land surrounding the project area provides habitat for terrestrial and avian species.

4.3.1 Terrestrial

Wetland and upland habitats in the Manokotak area support moose (*Alces alces*), brown (*Ursus arctos*) and occasionally black bear (*U. americanus*), coyote (*Canis latrans*), wolf (*Canis lupus*), red fox (*Vulpes vulpes*), snowshoe (*Lepus americanus*) and arctic hare (*L. arcticus*), beaver (*Castor canadensis*), otter (*Lontra canadensis*), mink (*Mustela vison*), muskrat (*Ondatra zibethicus*), porcupine (*Erethizon dorsatum*), and various small mammals such as red-backed voles (*Clethrionomys rutilus*) and shrews (*Sorex* sp.). A small caribou (*Rangifer tarandus*) herd (Nushagak Peninsula Caribou Herd) concentrates south of Manokotak and south of the Igushik River. The Nushagak Peninsula herd is known as a non-migratory caribou herd. An occasional band of individuals of the Mulchatna Caribou Herd have been known to move through the Manokotak and Dillingham area within several miles of the project area. There is no caribou calving, migration, or general use by caribou in the proposed project area. Some moose may travel through the project area but do not tend to concentrate in the area. Winter moose concentration areas are found between Manokotak and Dillingham (east of the Snake River) and farther up the Weary and Igushik Rivers (upstream of Manokotak) (Aderman, 2003).

Moose is the most important big game resource for Manokotak residents. Subsistence hunting for caribou is also important. Other terrestrial mammal species important for subsistence activities include bears, beaver, hares, and porcupine (Wright and Chythlook, 1985; Schichnes and Chythlook, 1988.)

4.3.2 Avian

Avian populations from the North American Pacific Flyway and several Asiatic routes funnel through Bristol Bay semiannually on their way to and from northern nesting grounds (Alaska Land Use Council, 1985). Manokotak area wetlands support substantial populations of these migratory waterfowl (ACMP, 1992). Resident bird species in the project area include the black-capped chickadee (*Poecile atricapillus)*, red-breasted nuthatch (*Sitta canadensis*), common raven (*Corvus corax*), black-billed magpie (*Pica pica*), gray jay (*Perisoreus canadensis*), spruce grouse (*Falcipennis canadensis*), and willow ptarmigan (*Lagopus lagopus*). More than 100 species of seasonal migratory birds likely pass through the area to breeding grounds farther north. Migratory bird species likely to nest in the project area include warblers, sparrows, thrushes, and common redpolls (*Carduelis flammea*) (Aderman, 2003).

The nearest known bald eagle (*Haliaeetus leucocephalus*) nest locations are more than 5 miles away from the proposed airport alternatives. Togiak NWR personnel regularly fly over Manokotak during the course of refuge surveys and will opportunistically record eagle nest locations. The refuge is not aware of any bald eagle nests in the project area (Aderman, 2003; Liedberg, 2004).

Many species of birds and bird eggs are harvested for subsistence use. Important bird species used for subsistence activities include willow ptarmigan, spruce grouse, sandhill cranes (*Grus canadensis*), tundra swans (*Cygnus columbianus*), and numerous species of ducks and geese (Schichnes and Chythlook, 1988).

4.3.3 Fisheries

The Bristol Bay region supports five species of Pacific salmon, which provide a major portion of the world's salmon supply. The Igushik River provides water and substrate necessary for spawning, rearing, and migration of anadromous fish populations including sockeye (*Oncorhynchus nerka*), coho (*O. kisutch*), and king (*O. tshawytscha*) salmon, and Arctic char (*Salvelinus alpinus*). The Weary River also provides spawning habitat for all five species of salmon (sockeye, king, coho, pink, and chum) and Arctic Char. The Igushik and Weary River fisheries are harvested for subsistence, commercial, and sport purposes (Schichnes and Chythlook, 1988).

4.4 Water Resources

4.4.1 Groundwater

Limited groundwater information is available for the Manokotak area. Groundwater is the primary source of drinking water for the community, indicating the groundwater quality is generally good. However, it is possible that groundwater quality can be diminished by the presence of permafrost and poor reservoir materials. Well logs for the community indicate aquifers are located approximately 73 feet and 100 feet below ground surface at Manokotak Heights (ADNR, 2004). The water at the well supporting the school is reported to be rather acidic and is treated to reduce corrosiveness (Jackson, 2004). Because the direction of groundwater flow typically parallels surface topography, groundwater in the Old Manokotak and Manokotak Heights areas likely flows to the south or southwest.

4.4.2 Water Supply

Water for the City of Manokotak is drawn from two wells, then treated and stored in a 150,000-gallon water storage tank. The wells are approximately 90 feet deep and 150 feet deep (Jordan, 2004). A piped water and sewer system, constructed in 1972, serves 68 households in Manokotak with complete plumbing. Two homes and a duplex have individual wells. The Manokotak Heights Subdivision is served by a well and a water treatment system, but water shortages have occurred (ADCED, 2004). The school is served by a 200-foot well and treatment system (Jackson, 2004).

4.4.3 Surface Water

Manokotak is on the Igushik River and sits between the east bank of the river and a hill that rises to an elevation of approximately 850 feet. The existing airstrip lies approximately 1,300 feet northeast of the Igushik River and approximately 3,000 feet north of the Manokotak sewage lagoon. Three small ponds are within approximately 2,500 feet of Alternative R3, and another pond lies to the west of the potential Ridge material source and the proposed access road to Alternative R3. The Igushik and Weary Rivers are navigable from the end of May to late October. Lakes and ponds are generally ice-free from mid-June to late October.

4.5 Wetlands

The vegetation types surrounding Manokotak are a mixture of moist tundra and upland mixed woodland forest (Viereck et al., 1992). The upland mixed forest areas occur on well-drained soils with dominant trees consisting of white spruce (*Picea glauca*), paper birch (*Betula papyrifera*), quaking aspen (*Populus tremuloides*), and cottonwood (*Populus balsamifera*). Willows, including Bebb's willow (*Salix bebbiana*) and diamond-leaf willow (*Salix planifolia*), are common shrubs. Common vegetation found in the moist tundra areas includes mosses, lichens, grasses, sedges (*Carex* spp.), willows (*Salix* spp.), dwarf birch (*Betula nana*), Labrador-tea (*Ledum palustre*), crowberry (*Empetrum nigrum*), bog blueberry (*Vaccinium uliginosum*), and numerous other shrubs and herbs.

Nine wetlands have been delineated in the project area (Figure 3). A large wetland complex borders much of Alternative E1 (MACTEC, 2004). Four wetlands were delineated along the access road to Alternative R3, and a large wetland complex is situated to the south of this proposed location. Two small wetlands were delineated on the east side of the existing material source on the Weary River Access Road. The wetlands were sampled and classified according to the system developed by Cowardin et al. (1979). The most common wetland types identified were PSS1/EM5B (saturated shrub bogs with 30% or greater canopy of broad-leaved deciduous shrubs, with the remaining vegetative cover consisting of persistent emergents) and PSS1/EM5F (semipermanently flooded bogs with 30% or greater canopy coverage of broad-leaved deciduous shrubs, with the remaining portion of the vegetative cover consisting of persistent emergents).

Functions and values for wetlands in the project area were assessed following methods established by the U.S. Army Corps of Engineers (USACE), New England District (USACE, 1999). The most important biological function of wetlands in the survey area was providing undisturbed habitat for mammalian and avian wildlife. The most important physical function was sediment/toxicant retention. The most important sociological/cultural values were visual quality/aesthetics and uniqueness/heritage. Wetlands in the project area are also important for subsistence activities (see Section 4.3, Fish and Wildlife Resources).

A jurisdictional determination was received from the USACE on April 13, 2004 (Appendix E). The USACE requested a more detailed wetland survey of the potential Ridge material source on the west side of the proposed access road to Alternative R3 prior to construction but approved all other wetland delineations conducted for this project. MACTEC's original wetlands delineation had classified the potential Ridge material source as a wetland/upland mosaic with one-third of the area considered wetland and two-thirds considered uplands (MACTEC, 2004). The second, more detailed survey classified the site as uplands (ADOT&PF, 2004). The USACE provided a jurisdictional determination on November 5, 2004, concurring that the Ridge material site is uplands.

Following agency scoping, detailed topography became available, allowing the project design to avoid wetlands in the placement of the apron and access road. The selected locations were outside the original wetland delineation area, but the delineation did include field samples from areas that exhibited similar vegetative features in the aerial photo review. Based on those results, MACTEC "believe[s] that it is likely that the new alignment/location will not affect wetlands" (Appendix E, Robertson, 11/15/04). A revised JD will be obtained in conjunction with the EA review process (Appendix A, Telephone Log, 12/6/04).

Both wetland reports are available for review at the ADOT&PF Central Region office.

4.6 Hazardous Materials

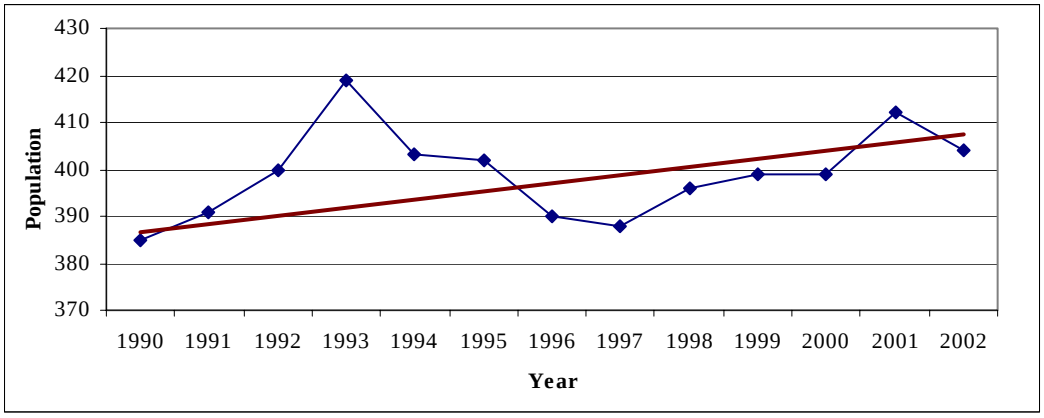
The Phase I Preliminary Site Investigation performed in support of this project identified no recognized environmental conditions in the project vicinity (Appendix F). The single use of the existing airport and the undeveloped nature of the alternative airport location and existing and potential material sites precluded the necessity of a land title record search and review of a historical aerial photograph sequence.

Two 500-gallon diesel fuel tanks and a SREB housing airport maintenance equipment are situated at the existing airport apron. The SREB floor is gravel, and small oil-stained areas on the floor from incidental drips during oil changes are reported. No stains associated with the diesel tanks are reported (Alakayak, 2003).

4.7 Population

The following chart presents Manokotak's historical population trend over 13 years (PDC, 2004).

Chart 1 – Manokotak Historic Populations



In 2002, Manokotak's population was 404, with Alaska Natives, primarily Yup'ik, comprising over 94% of the population. Data is from the Alaska Department of Labor (ADOL), Research and Analysis Section, Demographics Unit, and from the ADCED. Based on ADOL projections, the following table presents Manokotak population projections on low, middle, and high growth rates for the Dillingham Census Area of the Southwest Region of Alaska.

Table 3 – Manokotak Population Projection
Based on Alaska Department of Labor Census Area Projections

Year	Population		
	Low 0.47% Annual Growth	Middle 0.79% Annual Growth	High 2.54% Annual Growth
2002[1]	404	404	404
2007	414	420	458
2012	423	437	519
2022	444	473	667

[1] Base year, population verified by ADCED.

The population of Manokotak has fluctuated between 385 and 419 over the last 13 years. A linear regression analysis (Chart 1, solid line) was performed on the historical population data and projected to the year 2022. Results indicated an average annual growth rate of 0.44% with a projected year 2022 population of 440. Results of the analysis of the past 13 years of population data are lower than the ADOL's projected low annual growth rate. A third data source, the *SAT Plan*, forecasts the population in 2020 to be 540, giving an annual growth rate of 1.52%. This falls between the middle and high growth rates projected by ADOL. For purposes of the aviation forecast in Section 2.1.3, the linear regression rate (0.44%), ADOL's projected middle annual growth rate (0.79%), and the *SAT Plan* projected rate (1.52%) were considered.

4.8 Government

Manokotak is a Second Class City incorporated under Alaska Statutes in 1970. The Bureau of Indian Affairs (BIA) acknowledges the Manokotak Village Council as the Federally recognized tribe. Manokotak Natives, Ltd. is the Village Corporation formed under the provisions of the Alaska Native Claims Settlement Act (ANCSA). Manokotak Natives, Ltd. is a member of the Bristol Bay Native Corporation (BBNC), the ANCSA Regional Corporation. Manokotak is in the coastal zone and belongs to the Bristol Bay Coastal Resources Service Area. Other organizations that Manokotak belongs to include the Bristol Bay Economic Development Corporation, the Bristol Bay Native Association (BBNA), the Bristol Bay Housing Authority (BBHA), the Bristol Bay Area Health Corporation (BBAHC), and the Southwest Alaska Municipal Conference (SWAMC).

4.9 Community Services and Utilities

A piped water and sewer system, constructed in 1972, serves 68 households in Manokotak with complete plumbing. Two homes and a duplex have individual wells. Manokotak Heights Subdivision and the school are served by their own well and water treatment system, but water shortages have occurred. There are two sewage lagoons, one for Old Manokotak and one for Manokotak Heights Subdivision, each within a mile of the area it serves. A feasibility study is underway to examine water, sewer and landfill improvements, including possible relocation of the landfill. Although it is not the reason for the study, the landfill is closer to the existing airport than FAA standards recommend. The favored relocation site is next to the existing gravel pit along the Weary River Access Road. Manokotak Power Company provides electricity. Manokotak Natives, Ltd., which operates the power company, is reportedly seeking funding for power plant upgrades.

One hundred forty-two students attend the community's only school, which is located near Manokotak Heights. The local health clinic is located in Old Manokotak, and a new clinic is

scheduled for construction in Old Manokotak in 2005. Auxiliary health care is provided by Manokotak First Responders. Patients who cannot be treated locally are transported to hospitals in Dillingham or Anchorage.

The City of Manokotak is responsible for maintenance and snow removal on the Weary River Access Road. Currently, the road is only cleared from Old Manokotak to Manokotak Heights, just past the school.

4.10 Economy

Ninety-six residents hold commercial fishing permits for salmon and herring fisheries. Many residents also trap fox, beaver, mink, and otter; trapping has been an attractive lure to the area, although it has declined since the 1960s. Residents depend heavily on fishing and subsistence activities, and many move to Igushik or Ekuk each summer for the fishing season. Salmon, herring, sea lion, beluga whale, trout, ptarmigan, waterfowl, and berries are harvested. Several area villages, especially Togiak and Twin Hills, share these resources.

ADCED reports from the 2000 U.S. Census that:

- 64.8% of Manokotak residents 16 years old and older are not employed
- 15 residents are employed by private industry
- 73 residents work for the government (City, Tribal, State, Federal, schools)
- 2 residents work for the military

4.11 Transportation

4.11.1 Water

The Igushik River is navigable by boat during the summer and passable by snow-machine during the winter. During the summer months, residents use skiffs to hunt, gather, and travel to nearby villages such as Dillingham.

Barge traffic is plentiful during the summer, delivering bulk items to communities at a lower cost than air cargo. Yutana Barge Lines delivers cargo and fuel from Dillingham. However, the Igushik's course is a series of tight, broadly meandering loops, so many miles of waterway must be traveled to cover a comparably short distance in air miles. The recent construction of the Weary River Access Road and barge landing cut 40 miles off the river shipping route, but because the bulk fuel tanks are located near the Igushik River, fuel is still barged on that route. Manokotak does not have a dock, so barges off-load cargo onto the shore. The Manokotak barge landing is reported to be adequate to support the project without improvements.

4.11.2 Air

The State of Alaska owns and operates the Manokotak Airport. Manokotak Airport consists of a single gravel runway (2,720 feet by 60 feet) with a 200-foot taxiway connecting the runway to a 200-foot by 400-foot aircraft parking apron. Facilities are shown on Figure 2 and the 1985 Airport Layout Plan (ALP; see Appendix D). The deficiencies are discussed in Section 2.1.2.

4.11.3 Ground

The predominant modes of ground transportation in Manokotak are all-terrain vehicles (ATVs) and pickup trucks in the summer and snow-machines and pickup trucks in the winter. A trail connects the community to the neighboring villages of Dillingham and Twin Hills, but it is impassable during portions of the year.

4.12 Adjacent Land Use (Appendix B, Land Status and Ownership Maps)

4.12.1 Land Ownership

Existing Airport (E1 and No-Build)

Manokotak is located in the Bristol Bay Recording District. The townsite encompasses 36.4 square miles of land and 0.9 square miles of water. The existing airport is located in Township 14 South, Range 59 West, Sections 1 and 12 of the Seward Meridian.

ADOT&PF owns approximately 186 acres of the 249-acre airport property, with the remaining 63 acres protected by an avigation and hazard easement from Manokotak Natives, Ltd., and the City of Manokotak (Appendix B, Land Status and Ownership Maps, Figure B-1). As required by a reverter clause in the original acquisition documents (MLA, 2003), if the land is no longer used by ADOT&PF for an airport, a portion of the existing airport property would eventually be relinquished by the State to Manokotak Natives, Ltd. (~51 acres) and the City of Manokotak (~4 acres).

Manokotak Natives, Ltd. and the City of Manokotak are the two major owners of the surface estate in the area. Other land ownership adjacent to the airport property includes:

- Private and public landowners in Toyukak Subdivision and Old Manokotak
- A consolidated bulk fuel storage facility and gas station with multiple owners
- National Guard Armory on a lot leased from ADOT&PF by the Alaska Department of Military and Veterans Affairs

Subsurface rights are owned almost exclusively by the BBNC, with the only exceptions being the ADOT&PF subsurface estate for Tract I and the subsurface rights retained by the City of Manokotak on some individual parcels within the Federal Townsite. Tract IV, a 3.82-acre tract, is owned by ADOT&PF (surface) and BBNC (subsurface) with a reverter clause to the City of Manokotak. The subsurface estate of Tract IV is restricted by a non-development covenant, which disallows uses of the subsurface estate that would interfere with airport operations.

Relocation Site (R3)

Manokotak Natives, Ltd. is the major owner of the surface estate in the area (Appendix B, Land Status and Ownership Maps, Figure B-2). There are three Native Allotments in the vicinity of Alternative R3, all awaiting certification:

- U. S. Survey 11786, Lot 3 belongs to Nels C. Franklin and is located approximately 2,500 feet from the proposed site
- Native Allotment, U. S. Survey 11786, Lots 1 and 2 belong to Moses Toyukak, Sr., and are about 5,000 feet away from the proposed site.

- U. S. Survey 12090 belongs to Christian Itumulria; it is also about 5,000 feet away from the proposed site

The Togiak National Wildlife Refuge is also adjacent to this site; its boundary is approximately 1,800 feet from the proposed runway end (Appendix B, Land Status and Ownership Maps, Figure B-3).

4.12.2 Material Sites

A number of material sites have been identified as potential sources of construction material for this project: 1) the Weary River Access Road material site; 2) the ridge near Alternative R3; 3) the Loop Road site; 4) the Hillside site adjacent to the existing airport (see Section 4.2.2, Potential Material Sites). With one exception, Manokotak Natives, Ltd. owns the surface rights at all material sites and BBNC retains ownership of the subsurface rights. At the Hillside site, the State of Alaska owns both the surface and subsurface estates.

4.12.3 Residential

Due to terrain constraints, expansion of the original townsite is limited. Because of this, the village of Manokotak is divided into two separate locations: Old Manokotak and Manokotak Heights.

Old Manokotak, which includes the Federal Townsite and the Toyukak Subdivision, is adjacent to the existing airport property. Residences lie within the approach to the existing airport. Alternative E1 would require moving the threshold 975 feet to the north so that the RPZ does not encompass the Toyukak Subdivision.

Manokotak Heights Subdivision is located approximately 4 miles southeast of Old Manokotak. The site for Alternative R3 is approximately 12,000 feet southeast of Manokotak Heights.

4.12.4 Trails and Easements

ANCSA Section 17(b) authorized the reservation of public easements on lands conveyed to Native Regional and Village Corporations. There is one 17(b) trail easement, EIN 3 C5 (BLM #BBDILL 061), in the project area. The easement is 25 feet wide and runs from Dillingham westerly to Manokotak and Twin Hills. The portion of the trail near Manokotak runs approximately parallel to the Weary River Access Road (see Appendix B, Land Status and Ownership Maps). ANCSA Section 17(b) trails are not considered Section 4(f) properties under the U.S. Department of Transportation Act.

The Manokotak Village Council retains the surface rights within the Weary River Access Road right-of-way and along the 17(b) trail easement, which is managed by the U.S. Bureau of Land Management (BLM); BBNC retains the subsurface rights.

Manokotak Natives, Ltd. granted a Right-of-Entry and Easement to ADOT&PF for the unconstructed Snake River Access Road to provide access to a proposed boat haul-out area.

ADOT&PF has a full and unrestricted perpetual corporate easement from Manokotak Natives, Ltd. for the road. Between ¾ mile and 1 mile of this easement is closely aligned with the proposed access road to Alternative R3.

4.12.5 Landfill and Lagoon

While not directly adjacent to the existing airport property, both the landfill and the sewage lagoon are closer to the airport than allowed under FAA AC 150/5200-33. The sewage lagoon is located approximately 2,900 feet, and the landfill approximately 3,000 feet, from the existing runway. Both facilities are located to the south of the airport. The village is seeking funding to relocate the landfill to a parcel near the Loop Road material site (Figure 3). This location would be approximately 4 miles from the Alternative R3 site. The Manokotak Heights subdivision sewage lagoon is approximately 2.4 miles from the Alternative R3 runway end.

4.13 Other Community Actions or Plans

Table 4 lists other community projects in progress. In addition, Manokotak is seeking BIA Indian Reservation Roads funding for road improvements.

Table 4 – Community Projects

Project	Lead Agency	Fiscal Year	Stage
Aerial Mapping – Base Map	ADCED	2004	Contract
Rural Power System Upgrade	Alaska Energy Authority Budget Request Unit (AEA-RPSU)	2003	Contract
Community Projects and Improvements – Capital Matching	ADCED	2003	Construction
Indian Housing Block Grants (3)	U.S. Dept. of Housing & Urban Development (HUD)	2003 & 2002	Preliminary & Construction
Water, Sewer, Solid Waste Feasibility Study	Village Safe Water (VSW)	2002	Preliminary
Electric - Conceptual Design & Business Plan	AEA-RPSU	2002	Design
RPSU – Powerhouse Construction	AEA-RPSU	2002	Construction

Source: ADCED 2004.

5.0 ENVIRONMENTAL CONSEQUENCES

Following is an assessment of the potentially impacted resources identified. The assessment shows that no substantial impacts are expected with the proposed action. Figures 4 and 5 show the layout of the build alternatives in relation to physical features.

Evaluations were completed in accordance with FAA Orders 5050.4A and 1050.1D. No conflicts between the proposed alternative and the objectives of federal, state or local land use plans, policies, and controls were identified.

Impact categories determined to be non-issues for this project are listed below and discussed further in Section 5.10.

- Air Quality
- Water Quality
- U.S. Dept. of Transportation Act of 1966, Section 4(f)
- Historical, Architectural, Archaeological, and Cultural Resources
- Endangered and Threatened Species
- Floodplains
- Coastal Zone Management Program / Coastal Barriers
- Wild and Scenic Rivers
- Farmlands
- Energy and Natural Resources
- Light Emissions
- Environmental Justice

5.1 Noise

Quantitative noise analysis is only required when aircraft operations exceed 90,000 adjusted annual propeller operations (FAA AC 5050.4A). The forecasted operations at Manokotak Airport, projected at 5,814 in 2022, do not approach this threshold. However, the alternatives may result in differences of nuisance noise.

Build Alternatives

Alternative R3 (Preferred Alternative): Aircraft takeoffs and landings would subject Manokotak Heights Subdivision to additional noise because the airport would be closer to them (though still 2.5 miles away). The only operating school is located near Manokotak Heights. As discussed above, because the volume of traffic would remain below the threshold, the relocation of the airport would not result in incompatible land uses or noise levels. Levels of aircraft noise in Old Manokotak would be reduced with the development of this alternative since the airport would be relocated approximately 6 miles out of town.

Alternative E1: Alternative E1 would not place the airport closer to or very much further from noise-sensitive areas. The alternative shifts the runway slightly away from the village, not enough to make a noticeable difference from the No-Build. The noise volume might increase slightly as larger, louder aircraft begin to use the runway. However, the larger aircraft would need to make fewer trips, thus decreasing the frequency of air traffic noise. In the short term, no difference is expected as compared to the No-Build. In the long term, the increased volume of noise from the larger aircraft would be offset by the less frequent flights.

No-Build Alternative

As the number of operations increases to accommodate the potential growth, the residential properties surrounding the airport would hear the aircraft noise on a more frequent basis.

5.2 Compatible Land Use

Land use impacts related to noise, changes to ground transportation, land acquisition, landfill and sewage lagoon location, and the houses, bulk fuel storage facility, and gas station in the approach may be experienced as a result of the build and No-Build alternatives. Noise impacts are discussed in detail in Section 5.1 above. Other effects on land use are analyzed under the appropriate impact category. Impacts to overall compatible land use are expected to be minimal.

5.2.1 Changes in Ground Transportation

Build Alternatives

Alternative R3 (Preferred Alternative): The preferred alternative would affect ground transportation patterns and traffic volumes within the community. A 2.7-mile-long access road would be constructed from the Weary River Access Road east of Manokotak Heights to the airport apron. The relocation of the airport would cause an increase in travel distance to the airport of approximately 8 miles for residents of Old Manokotak. The relocation would decrease the travel distance for Manokotak Heights residents by approximately 1 mile. Manokotak has an airline agent who provides group transportation for passengers and cargo to and from the airport. In part because of this, impacts in terms of user costs or delays are not expected to be substantial.

Traffic levels would increase on the Manokotak Heights Spur Road and the 3,000-foot section of the Weary River Access Road from the intersection east of Manokotak Heights Subdivision to the turnoff for the new airport access road. This would be offset by a reduction in traffic through Old Manokotak. No other changes to ground transportation are expected as a result of the preferred alternative.

Alternative E1: The impacts to ground transportation under Alternative E1 are expected to be minimal. Alternative E1 would require approximately 3,300 feet of new access road, extending the travel distance for all residents by approximately 2,100 feet. A number of unauthorized, unpermitted trails on airport property would be eliminated. No formal closure or relocation effort of the trails is warranted because of their unpermitted status. No other changes to ground transportation are expected as a result of Alternative E1.

No-Build Alternative

The No-Build Alternative would not result in an appreciable change in ground transportation patterns or volumes. Although ADOT&PF prohibits the use of the trails on airport property, this is very difficult to enforce, and thus unauthorized use would likely continue. This is unsafe because activities on or near runways are opportunities for collision and can distract pilots.

5.2.2 Land Use, Status, and Acquisition

Build Alternatives

Both build alternatives would result in changes in land use and land status (see Appendix B for land status maps) and would require ADOT&PF to acquire additional land. These impacts are not expected to be substantial.

In addition to the land required for the proposed 3,300-foot runway to be constructed under this project, ADOT&PF intends to acquire sufficient property to include the RPZ for future development of a 4,000-foot runway and for transitional surfaces to a height of 35 feet above the primary surface. This land has been selected to avoid, to the extent practicable, known environmentally sensitive areas such as wetlands and the Togiak National Wildlife Refuge. No development will occur on this additional property under this project; therefore, there will be no environmental impacts on this land at this time.

Alternative R3 (Preferred Alternative): Construction of the preferred alternative would require acquisition of new property and release of lands at the existing airport. At the R3 site, ADOT&PF would acquire approximately 330 acres from Manokotak Natives, Ltd. (surface estate) and the BBNC (subsurface estate).

Manokotak Natives, Ltd. has entered into an agreement with the United States of America, acting through the Fish and Wildlife Service (USFWS), to place the lands they received from ANCSA into the Alaska Land Bank Program. The purpose of the land bank is to ensure compatibility between local land use and the management plan for adjoining federal lands. The land required for Alternative R3 is currently enrolled in the land bank. If the preferred alternative is chosen, the village corporation would need to write a letter to the USFWS asking to withdraw this land from the Land Bank Agreement and providing a legal description of the land to be withdrawn. The withdrawal would automatically take place 90 days after receipt of the letter, after which ADOT&PF could acquire interest in the lands.

The land around the preferred alternative is currently used for hunting and subsistence. There are no known planned uses for this land. The potential material site on the ridge considered for the project is owned by Manokotak Natives, Ltd. (surface) and the BBNC (subsurface). The preferred alternative would change the land use from its current use (undeveloped) to commercial (airport and access road). There is no shortage of hunting and subsistence lands in the Manokotak area; therefore, the land use changes are considered a minimal impact.

The new airport access road would cross an ADOT&PF corporate easement from Manokotak Natives, Ltd. (for the unconstructed Snake River Access Road) and an ANCSA Section 17(b) easement managed by the BLM. Coordination for these easements would be required prior to construction but is not considered a major concern.

Under R3, 63 acres of avigation and hazard easements at the existing airport would no longer be required. Alternative R3 would require decommissioning of the existing airport facility. Some of the existing airport land may eventually revert to the City and the Bristol Bay Native Corporation (BBNC). Due to the lack of land suitable for development in Old Manokotak, the community would desire to use any airport property released by the State to expand the village. However, because of

the high cost and stringent regulatory requirements to build in wetlands, such expansion would likely be limited to the existing embankment areas. Thus, release of these lands is not expected to result in extensive impacts.

Alternative E1: Construction of Alternative E1 would require ADOT&PF to acquire approximately 63 acres of additional land, bringing the total airport property to approximately 312 acres. The land is owned by Manokotak Natives, Ltd. and the BBNC. It lies to the north of the existing runway and is currently used for hunting and subsistence purposes. As there is no shortage of hunting and subsistence lands in the Manokotak area, the land use impacts are considered minimal.

If Alternative E1 is selected for construction, the publicly owned National Guard Armory would need to be relocated off of airport property. The bulk fuel storage facility, gas station, and residences would remain in the approach off the south end of the runway. The presence of these structures in the approach, particularly the bulk fuel storage facility, could potentially have a substantial effect on aviation and public safety (see 5.2.4 below).

Without clearing obstructions (FAA Regulations Part 77), extending the existing facility would not alleviate incompatible land use near the airport. An alternative to clear obstructions was evaluated, but it was considered unreasonable due to excessive cost (Appendix C).

No-Build Alternative

The No-Build Alternative would not alter land, land use, or land status in the airport vicinity. No additional property acquisition would be required. Terrain restrictions and the existence of the airport would preclude expansion of the community of Manokotak at the original village location. Current compromises of aviation and public safety would remain unmitigated.

5.2.3 Landfill and Sewage Lagoon Location

Build Alternatives

Alternative R3 (Preferred Alternative): Construction of Alternative R3 would increase the separation distance between the runway and the current community landfill by more than 4 miles, thereby decreasing the potential for wildlife/aircraft interactions. Alternative R3 would also be more than 2 miles from the sewage lagoon at Manokotak Heights. The Old Manokotak lagoon would be even farther away (~6 miles). The community is considering moving the landfill to a site approximately 4 miles northeast of R3 (Figure 3 and Appendix A). Neither the existing location nor the relocation site would result in an incompatible land use for the preferred alternative.

Alternative E1: The existing village landfill is located approximately 4,700 feet south of the threshold of Alternative E1, and the Old Manokotak sewage lagoon is approximately 4,000 feet from Alternative E1. While this represents a slight improvement over existing conditions, both separation distances are still less than the 10,000 feet required by FAA standards.

The potential landfill relocation site is approximately 2 miles southeast of Alternative E1, so relocation of the landfill would mitigate one of the current substandard conditions. However, the sewage lagoon would remain an issue.

No-Build Alternative

Manokotak's existing landfill is situated approximately 3,800 feet south of the existing runway. The Old Manokotak sewage lagoon is located approximately 3,000 feet southeast of the existing runway. Both separation distances are substantially less than the 10,000 feet required under FAA standards. The facilities can attract birds, increasing the risk of bird/aircraft collisions.

The proposed landfill relocation site is approximately 2 miles southeast of the existing airport, so relocating the landfill would mitigate one of the current substandard conditions. However, the sewage lagoon would remain an issue.

5.2.4 Proximity of Community and Bulk Fuel Storage Facility

Build Alternatives

Alternative R3 (Preferred Alternative): The R3 site is located 12,000 feet from the Manokotak Heights subdivision, the nearest residential community. The bulk fuel facility is located in Old Manokotak, so this alternative mitigates the safety concern associated with the bulk fuel facility's proximity to the existing airport (see No-Build Alternative, below).

Alternative E1: Under Alternative E1, the south end of the runway would shift 975 feet north of the existing facility so that the RPZ no longer encompasses the residential properties at the south end of the runway (Toyukak Subdivision). The bulk fuel facility is located approximately 2,950 feet from the south end of the E1 runway, so the safety concerns regarding the bulk fuel facility are the same as for the No-Build Alternative (described below).

No-Build Alternative

Manokotak's 247,000-gallon capacity bulk fuel facility and a portion of Old Manokotak are directly in line with the approach for Alternative E1 and the No-Build Alternative. The bulk fuel storage facility and adjacent gas station are located approximately 1,970 feet from the end of the existing runway. This is a safety concern, since an aircraft accident on landing or takeoff could involve these structures. Most air transportation accidents are associated with takeoff or landing, as supported by the National Transportation Safety Board's 1996/97 statistics (ODA, 2003).

The August 2002 revised draft of the "Community of Manokotak Emergency Disaster Plan" (Appendix B) recognizes this concern. This report states, "Approach to landing north, airplanes have to fly low just west of the main village and right above the bulk fuel facility. There have been at least two airplane crashes in the past during approach or immediately after takeoff." The bulk fuel facility is approximately 100 feet from the Manokotak Power Company's generators and 90 feet from the nearest residence. Reports indicate that up to one-third of the Old Manokotak community would be damaged or destroyed if the tank farm exploded at full capacity (see Appendix A, Telephone Log, M. Andrew, 11/11/03).

This safety concern would remain uncorrected under the No-Build Alternative.

5.3 Social Impacts

Build Alternatives

The proposed project would not divide or disrupt established communities. The village is split into two distinct areas. The original village, Old Manokotak, has the majority of the population and is adjacent to the existing airport. Expansion at Old Manokotak is constrained by terrain and wetlands. A subdivision was built 4 miles away to accommodate the growing population.

The proposed project would not disrupt orderly, planned development. Manokotak does not have formal zoning or a land planning board. The community plans future expansion around Manokotak Heights. The community is waiting until the location of the airport is decided to finalize plans to relocate the landfill. The community is already planning to upgrade the power plant, and neither build alternative would affect these plans. The community is planning to build a new medical clinic at Old Manokotak in the near future.

The proposed project would not create an appreciable change in employment.

Extensive community involvement has occurred throughout the development process for this proposal (see Section 6.2). No minority communities or low-income communities would be disproportionately adversely impacted by this proposal. All persons were equally invited to participate in the proposed project.

Alternative R3 (Preferred Alternative): Social impacts associated with Alternative R3 would be primarily related to the change to ground transportation and making more land accessible for development and subsistence activities. There are no relocations associated with Alternative R3.

Increased ground distance to the airport (discussed above in 5.2.1) would be somewhat offset by a reduction in air travel distance to Dillingham. The construction of Alternative R3 would:

- Decrease by 1 mile the travel distance for Manokotak Heights residents
- Increase by 8 miles the travel distance for Old Manokotak residents and patients being evacuated from the medical clinic
- Decrease the air travel distance by about 10 miles

The increased distance from the medical clinic is a concern for some residents; however, R3 would provide a more reliable and safer facility, increasing the probability that a medevac flight could land when needed. Residents who work at the clinic have concerns about getting patients to the airport at the R3 site because the road to Manokotak Heights has reportedly been closed during periods of snow drifting. If the road to the airport needed to be cleared during an emergency, the City and airport graders could work together to expedite the process. This alternative would also be more reliable because the new runway would be faster to plow as compared to Alternative E1 or the No-Build Alternative (see M&O discussion in Section 3.1). The decrease in air travel distance saves some time and might reduce air travel costs.

Modes of ground transportation in Manokotak include automobiles, snow machines, and ATVs. As discussed in the Changes to Ground Transportation section, an airline agent arranges group transportation to and from the airport for passengers and cargo.

Alternative R3 would also open up access to more land for the Manokotak residents. Residents have shown interest in having more land for subsistence activities and building homes. In addition to the land that the construction of R3's access road would make accessible, a small portion of the land at the existing airport would potentially become available to build on, as discussed in Sections 4.12.1 and 5.2.2. The community would like to use the current airport land to expand if Alternative R3 is chosen and the land relinquished.

Alternative E1: Social impacts associated with Alternative E1 would be related to airport reliability/ safety, ground transportation, and the relocation of the armory facility (see discussion in Section 5.2.2). Alternative E1 does not require relocating any residential or business property, although the publicly owned National Guard Armory would require relocation.

Potential safety concerns previously mentioned that are associated with the use of Alternative E1 include:

- Presence of the bulk fuel facility in the approach path, which increases the risk of a dangerous explosion in the event of an aircraft crash
- Inability of medevac planes to land in inclement weather
- High incidence of crosswinds

Construction of Alternative E1 would move the airport apron approximately 2,000 feet farther from Old Manokotak, thus increasing all ground travel, including medevac transfers from the clinic, by this distance. Air distance would not be changed by a meaningful amount.

Relocating the publicly owned National Guard Armory building would be necessary under Alternative E1. There is not much available property for relocation, and whatever site the Armory was relocated to would not be available for other community development. If Alternative E1 were chosen, a relocation analysis would be required to determine the full extent of the impacts this would have on the community; however, it is anticipated that these impacts would not be substantial.

No-Build Alternative

The No-Build Alternative would not change the conditions under which the residents of Manokotak now abide. Safety concerns at the current location would remain. These concerns result from the conditions listed in the purpose and need (see Section 2) and are generally the same safety concerns related to Alternative E1 above.

5.3.1 Subsistence Activities

Overall, subsistence activities would not be substantially impacted by either of the build alternatives. Although subsistence activities are vital to the community, there is an abundance of resources similar to those impacted. Both alternatives would provide increased road access to these resources. The No-Build Alternative would cause no impact to resources and therefore none to subsistence activity.

5.4 Induced Socio-Economic Impacts

Build Alternatives

Either build alternative would improve the reliability of services to the community, but neither is expected to cause a substantial shift in patterns of population movement and growth.

Some community members have concerns about traveling to the airport at Alternative R3 during winter months. ADOT&PF would maintain the access road from the airport to the Manokotak Heights subdivision cutoff.

Improved access to the community may have the potential to bring in tourists, fishermen, and hunters for possible revenue. One resident said that he felt larger planes [than those currently using the airport] could help the community to ship out more fish. These impacts could be perceived as either positive or negative, but in either case, they are not expected to be substantial.

No-Build Alternative

The poor condition of the airport has induced a negative impact on the community, as attested by a number of letters and comments (see Appendix A, Public Involvement). Selecting the No-Build Alternative would have a substantial negative impact on the community.

5.5 Biotic Communities

Build Alternatives

There would be a permanent loss of plant communities and wildlife habitat as a result of both alternatives; however, the amount of plant community lost or wildlife displaced is small relative to the quantity and quality of similar habitats remaining in the local area and region. The habitat lost does not support any rare species. Temporary impacts to biotic communities associated with both build alternatives would be mitigated by implementation of BMPs during construction. Clearing vegetation or alteration of nesting habitat would be avoided during the nesting season (April 15-July 31) to minimize impacts to migratory birds (Appendix A, Agency Coordination, Mann, 10/27/03).

Alternative R3 (Preferred Alternative): Cutting and filling of, and gravel extraction from, undeveloped land associated with Alternative R3 would result in a minor yet permanent alteration of existing habitat. Approximately 65 acres would be affected by cut-and-fill activity to construct the access road, airstrip, and apron. Gravel extraction activities are estimated to affect approximately 43.2 acres of previously undeveloped land. The proposed action would also require approximately 130 acres of tree clearing to support the construction and remove airspace penetrations. Where tree

clearing would be required with no other construction activity, the vegetation mat would be protected, promoting the regrowth of shrubs. The portion of habitat lost does not substantially lower the carrying capacity of the overall area, and the habitat to be cleared, cut, or filled does not support rare, threatened, or endangered species.

Neither Essential Fish Habitat (EFH) nor any resident aquatic species would be affected by project-related activities. Gravel for construction would likely come from the existing material sources along the Weary River Access Road and/or the Ridge area east of the proposed access road to Alternative R3. Because inland sources are available, it is unlikely the Contractor would extract gravel from river bars; if he chooses to do so, he will be responsible for obtaining all necessary permits and clearances. Construction equipment would be transported to Manokotak by barge. No placement of fill below ordinary high water would be necessary for equipment offloading.

If Alternative R3 is constructed, the end of the runway would be located approximately 2,000 feet east of Togiak NWR land. The refuge has not identified any actions associated with the proposed airport alternatives that may conflict with refuge objectives or activities (Liedberg, 2004).

Alternative E1: Because a portion of Alternative E1 would be constructed on the existing airport, Alternative E1 would require a smaller area of cut-and-fill activity, gravel extraction, and tree clearing in undeveloped land. The construction of the features would affect approximately 40 acres by cut-and-fill. Gravel extraction is expected to affect approximately 20 acres of undeveloped land. Clearing of trees to support the construction and remove airspace penetrations would affect approximately 30 acres, although the vegetative mat would be protected to promote shrub regrowth.

Alternative E1 would place the airstrip a little farther from the existing landfill and sewage lagoon than the existing airport, but still not far enough to comply with FAA standards, so some potential for aircraft/wildlife interaction would remain. However, relocating the landfill may reduce this elevated potential somewhat. The USDA has advised that because Alternative E1 is not the Preferred Alternative, no aircraft/wildlife hazard study is needed at this time.

No-Build Alternative

The No-Build Alternative would not change the current level of impact sustained by biotic communities.

5.6 Wetlands

Build Alternatives

The proposed airstrip, apron, and access roads for both build alternatives were placed to avoid wetlands (shown on Figure 3) or to minimize impacts to wetlands where practicable. For example, the site of the Alternative R3 runway was chosen to avoid placement of fill into wetlands. To the extent practicable, tree clearing required in wetland areas would be restricted to hand clearing or hydroax while the ground is frozen.

Wetland impacts during material extraction would be avoided by remaining within the existing boundaries of the Loop Road material site and implementing a 100-foot buffer between Wetlands 3 and 4 and the Weary River Access Road material site. The wetland delineation did not include a complete review of the Loop Road material site, but based on initial review of aerial photography, it is likely that wetlands exist beyond the boundary on the northeast side. Expansion to the west and south would avoid these potential wetlands. Since E1 is not the preferred alternative, there is no need to consider expansion of the material site, so a complete delineation and permitting of the Loop Road site is not needed at this time. However, if E1 should be chosen for construction, a delineation would be completed and the appropriate permits obtained at that time.

To further minimize wetland impacts, BMPs would be required to mitigate temporary indirect impacts to wetlands during construction. These BMPs would include the erection of silt fences where necessary, keeping staging from wetland areas, and restricting fueling from within 100 feet of wetlands or waters of the U.S. Wetlands would be delineated and staked before any use of material sites (Appendix A, Agency Coordination, Mann, 10/27/03). The contractor would be responsible for acquiring all permits and performing all mitigation for any site other than those discussed in Section 4.2.2. Permits and clearances for any such off-site support areas (material sites, disposal sites, stockpiling areas, equipment storage, etc.) would be provided to ADOT&PF prior to any use of those sites. Based on the Memorandum of Agreement among the FAA, USACE, ADOT&PF, USFWS, and Alaska Department of Fish and Game (ADF&G) regarding impacts to wetlands and other aquatic resources at airport improvement projects in Alaska, unavoidable wetland losses associated with this project would result in a fee-in-lieu donation of $500 per acre to the Non-Governmental Organization set up under the agreement.

Alternative R3 (Preferred Alternative): Alternative R3 would relocate the entire airport facility to uplands.

Gravel extraction activity at material sites is not likely to affect wetlands. Two small wetlands on the east side of the existing Weary River Access Road material source are PSS/EM wetlands. Both would be protected by 100-foot buffers.

Tree clearing operations would occur in 21 acres of wetlands. The clearing would be limited to hydro-ax when the ground is frozen or hand clearing and thus is non-jurisdictional. The tree clearing is required to remove penetrations from the airspace to provide for safe operations. Although the activity would be non-jurisdictional, Wetland 10 was rated as high value wildlife habitat for water birds (primarily waterfowl and shore birds) because it provides habitat for nesting, rearing, and migration. It is also part of a large wetland complex that extends into the Togiak National Wildlife Refuge, a factor that contributes to the value assessment (MACTEC, 2004).

The most important function of the wetlands being directly and indirectly impacted by Alternative R3 is undisturbed habitat for mammals and birds. The average wildlife habitat value of the wetlands impacted by the construction activities is moderate.

Alternative E1: Alternative E1 would be constructed almost entirely in wetlands (Figure 3). Total acres of PSS/EM wetlands directly affected by cut-and-fill activity would be approximately 30.9 acres. Approximately 4 more acres of non-jurisdictional tree clearing in wetlands would occur to remove

airspace penetrations. Gravel would be excavated from a site on a hill (the Hillside site; see Figure 5) just east of the existing runway apron and from the existing Loop Road material site. The potential Hillside site is in uplands, and its use would not affect wetlands.

Wetland 1, affected by the construction of Alternative E1, is considered high value wildlife habitat. Because of the wetland's proximity to the Igushik River, it may provide direct habitat for fish (MACTEC, 2004). Wetland 1 rated higher in value for all wetland functions than the wetlands affected by Alternative R3. Wetland 1 was rated as high value habitat because it acts as a filter for water flowing into the adjacent Igushik River, which is an anadromous fish stream. It also provides habitat for birds and floodwater storage.

Because Alternative E1 would cross wetlands perpendicular to the natural water flow toward the Igushik River, this alternative could affect the surface hydrology in the area, causing ponding on the east side of the airstrip with a corresponding drying on the west side of the airstrip. If this alternative were selected, a system to assure hydrology conductivity would be designed to mitigate this concern.

No-Build Alternative

Jurisdictional wetlands would not be affected under the No-Build Alternative. Because much of the existing runway is surrounded by wetlands, some incidental erosion and gravel spill from the runway into adjacent wetlands would continue to occur.

5.7 Solid Waste

Build Alternatives

The proposed airport upgrade would not have any direct relationship to collection, control, or disposal of solid waste. It would have little or no impact on the community's overall solid waste generation rate.

A slight increase in solid waste generation would occur during construction. The contractor would remove the solid waste generated by the construction from the project area and dispose of it at the community landfill. The existing landfill is not permitted and is above capacity, but a new landfill has been planned. If the new landfill is not open by the time airport construction begins, the contractor would be responsible for removing construction waste from the community and disposing of it in accordance with ADEC Solid Waste Program requirements. This aspect of the proposed project would not cause undue hardship to operators of the new landfill nor substantially reduce its capacity.

As discussed in Sections 4.12.5 and 5.2.3, the landfill is closer to the existing airport than FAA AC 150/5200-33 allows. The City of Manokotak is planning to relocate the landfill away from the airport.

No-Build Alternative

No impacts to the community's solid waste generation rate would occur under the No-Build Alternative. The separation distance between the airport and the landfill would remain substandard.

5.8 Hazardous Materials

Based on the hazardous materials assessment discussed in Section 4.6, the following describes the potential environmental impacts.

Build Alternatives

As part of the construction contract, the contractor would be required to develop a Storm Water Pollution Prevention Plan (SWPPP) and a Hazardous Materials Control Plan (HMCP) to address containment, cleanup, and disposal of all construction-related discharges of petroleum fuels, oils, and/or other hazardous substances. The construction contract would require the contractor to use only uncontaminated material. Should contamination be encountered during project construction, ADOT&PF would require the contractor to develop and implement a cleanup and disposal plan approved by the Alaska Department of Environmental Conservation (ADEC).

Alternative R3 (Preferred Alternative): Alternative R3 is situated on and adjoins undeveloped land in its natural state. No environmental conditions were recognized at Alternative R3 during the field reconnaissance, and sites identified in the Phase I report are not likely to affect the project area as a result of the type, extent, and/or location of contamination (MACTEC, 2004).

The areas of oil-stained gravel on the SREB floor were deemed not likely to present a material risk of harm to public health or the environment (MACTEC, 2004). Under Alternative R3, the SREB at the existing airport would no longer be needed and would be disposed of. Disposal of the SREB would likely include removal of the structure and utilities. Contaminated soils at the SREB could be left in place because they are *de minimis* and do not have the potential to impact human health or the environment. However, depending on when in the future the SREB disposal occurs, there might be a need for additional assessment work to determine the conditions at that time.

Alternative E1: The property at Alternative E1 is currently used as an airport. The SREB is the only structure that is part of the existing airport. The existing SREB would remain under Alternative E1 and would not pose a material risk to public health or the environment. With the exception of a few ATV trails, land adjoining the existing airport to the north, east, and west is undeveloped and in its natural state. Extending the existing runway and access road and relocating the apron would affect undeveloped land only.

No-Build Alternative

Hazardous materials would not be encountered under the No-Build Alternative. The existing SREB would remain but would not pose a material risk to public health or the environment.

5.9 Construction Impacts

Build Alternatives

The construction impacts are relatively short-term, lasting at the most two construction seasons. Though brief, they can still be annoying and sometimes detrimental. The following discusses potential construction impacts.

Noise
The greatest nuisance impact from construction is generally from the noise of heavy equipment operating throughout the day. Construction equipment would have sound control devices no less effective than those provided on the original equipment. No equipment would have an unmuffled exhaust. Alternative E1 has a greater potential for noise impacts than Alternative R3 because E1 is closer to the community.

Air Quality
Air quality emissions from equipment would be minimal due to the small amount of equipment required. The contractor may need to mitigate fugitive dust by watering exposed soils and gravel roads during dry and/or windy conditions. Alternative E1 has a greater potential for air quality impacts than Alternative R3 because E1 is closer to the community. The Air Quality Certification required by the 1982 Airport Act is included in Appendix E.

Material Sites
For both alternatives, it is expected that the contractor would haul material on existing roads and the proposed airport access road, although some improvements may be needed. Hauling operations through town or on roads used by the public would require appropriate traffic safety measures as outlined in ADOT&PF standard construction specifications.

The contractor would be required to develop a mining and reclamation plan for the expansion of any material source per the ADOT&PF standard construction specifications (see "DOT&PF General Development Guidelines for Material Sites" in Appendix E, Wetlands Permit).

If the contractor chooses to use a material site other than the ones being made available, he shall be required to acquire all necessary permits and clearances.

The Weary River Access Road site expansion was sized to provide the necessary material without excavating below the water table. However, extraction below the water table may occur because of the contractor's mode of operation or the quality of material available. If the contractor chooses to dewater during material extraction, he would need to acquire a General Wastewater Disposal Permit from ADEC for "excavation dewatering" during construction. The permit application requires detailed knowledge of specific operations: method of dewatering, daily flow rates, rate of pumping, etc. This information is dependent upon a contractor's equipment, so the contractor would be the permittee.

Water Quality
The project would require a National Pollution Discharge Elimination System (NPDES) permit, which would include a SWPPP and an HMCP (see "Hazardous Materials" below).

The Erosion and Sediment Control Plan (ESCP) would be prepared during final design. The plan incorporates BMPs to contain potential erosion and sediment from escaping the construction site. Most construction related impacts would be controlled and minimized in accordance with BMPs using standard procedures for erosion and sediment control, grading, fertilizing, and seeding temporarily disturbed areas.

The contractor is required to use the ESCP to prepare a SWPPP prior to construction. The contractor then submits the SWPPP to ADOT&PF for review to ensure that all practicable measures are taken to prevent erosion and sediment transport. The contractor would also be required to submit a "Notice of Intent" in compliance with the NPDES.

The water quality certification required by the 1982 Airport Act is provided in Appendix E.

Impacts specific to each build alternative are as follows:

- ***Alternative R3 (Preferred Alternative):*** Prior to establishment of vegetation on exposed slopes, minor, temporary construction related degradation of surface-water quality may result from surface runoff of sediment during periods of high overland water flow. Extraction of gravel from the existing pits on the Weary River Access Road and the Loop Road and the potential material source on the ridge south of the Weary River Access Road may extend below the groundwater table. The closest known drinking water wells to the Weary River Access Road material site and the Ridge site to the south are approximately 3,000 feet southwest of the sites. The existing Loop Road site is situated approximately 7,500 feet southeast of Old Manokotak. The wells are unlikely to be affected by excavation activities.
- ***Alternative E1:*** As with Alternative R3, prior to establishment of vegetation on exposed slopes, minor, temporary construction related degradation of surface-water quality may result from surface runoff of sediment during periods of high overland water flow. Gravel fill would be extracted from the Hillside site on the east side of the existing airport and from the existing Loop Road material site. As with the existing airport, Alternative E1 and the Hillside site would be adjacent to the city of Manokotak and therefore close to drinking water wells. However, the wells are unlikely to be affected by excavation activities because of the substantial vertical separation and because excavation within the Hillside site would be confined (to the extent possible) to the soil horizons above the water table. Because Alternative E1 would expose 3 times less surface area, the environmental consequences and mitigation with respect to construction related water quality for Alternative E1, although similar in nature, are on a smaller scale than for Alternative R3.

Archaeological

Should construction unearth unknown cultural resources, the contractor must cease construction activities in the immediate area and notify ADOT&PF's Project Engineer and Environmental Section as well as the State Historic Preservation Officer (SHPO). Work would not resume until appropriate measures to avoid or minimize the resources have been implemented. Appropriate measures would be developed and documented through Section 106 consultation with SHPO and the FAA.

Hazardous Materials

Hazardous materials required for operating equipment would be contained on-site, per state and federal regulations. No hazardous materials would be stored within 100 feet of a wetland or water source. Clean-up materials for accidental spills would be located on-site. A project-specific HMCP would be prepared in conjunction with the NPDES permit. The contractor would be responsible for the proper disposal of any hazardous waste generated by construction activities.

Clean-Up
The contractor would collect and make provisions for the disposal of all trash before leaving the site at the end of the construction project. The site would be walked and all evidence of construction activities removed, including station signing, flagging, surveying tape, and non-biodegradable erosion and pollution control materials.

Economic
Some beneficial but minor economic impacts can be expected due to construction of the project. This is due to the influx of money coming into the community and local services provided to workers. Additionally, construction jobs might be available for qualified local workers, though for some, the timing of construction activities in the summer conflicts with other cash economy jobs and subsistence activities.

No-Build Alternative

The No-Build Alternative would have no construction impacts.

5.10 Non-Issue Impact Categories

5.10.1 Air Quality

Manokotak is not within a non-attainment area. There is little or no potential to impair the ambient air quality. Forecasted air operations would not exceed the threshold (180,000 annual operations) that requires an Air Quality Analysis. An Air and Water Quality Certification as required by the 1982 Airport Act is provided in Appendix E.

5.10.2 Water Quality

Neither build alternative is expected to impact water quality as a result of the use of the airport facilities. An Air and Water Quality Certification as required by the 1982 Airport Act is provided in Appendix E. The current level of water quality would not change under the No-Build Alternative. Construction-related water quality impacts are discussed in Section 5.9.

5.10.3 U.S. Department of Transportation Act of 1966, Section 4(f)

The proposed project would not affect any publicly owned park, recreation area, wildlife refuge, or significant historic site. The Togiak National Wildlife Refuge near Manokotak is located approximately 160 feet from Alternative R3's proposed property boundary and approximately 2 miles from the property boundary of Alternative E1 and would not be affected by the proposed project. There are no legislatively designated special areas (state game refuges, sanctuaries, or critical habitat areas) in the project vicinity. The 17(b) trail is not considered a 4(f) property (see Section 4.12.4).

5.10.4 Historic, Architectural, Archaeological, and Cultural Resources

A review of the Alaska Historic Resources Survey revealed no historic properties. However, based on preliminary research and information gathered from the BIA, the SHPO determined "…it does

appear that there are some high potential areas within the project area (especially any high ground) that warrant an archaeological survey." (See Appendix A, Agency Coordination, Ludwig, 9/10/03.)

Northern Land Use Research, Inc. (NLUR) conducted a reconnaissance survey in the fall of 2003, and coordination was conducted with the Manokotak Village Council and the City as well as other Native representatives including BBNC, BBNA, and BIA. No sites were identified. Concurrence from SHPO was obtained on March 5, 2004 (Appendix E).

Following agency scoping, detailed topography became available, and the placement of Alternative R3's apron and access road was changed to avoid wetlands. A letter from NLUR (Appendix E, Cultural Resources Coordination, 11/18/04) confirmed that the new locations are likely clear of any sites. SHPO will be notified of this change as part of the EA review process.

The overhead power lines are expected to run within the access road corridor. This area was within the archaeological survey that received SHPO concurrence.

Construction specifications would include provisions for discovery of unknown archaeological, historical, cultural or paleontological remains. The contractor would be required to cease operations in that area and notify ADOT&PF and SHPO.

5.10.5 Endangered and Threatened Species

According to the USFWS and the National Marine Fisheries Service (NMFS), no threatened or endangered species are located in the project area (USFWS, 2004, and Appendix A, Agency Coordination, NMFS, 9/24/03). Thus, there would be no direct, secondary, or cumulative impacts to threatened and endangered species or their habitat from the build or No-Build alternatives.

5.10.6 Floodplains

According to the Federal Emergency Management Agency (FEMA), no Flood Insurance Rate Map (FIRM) exists for Manokotak. According to the USACE, there is "no known flooding" in Manokotak (Appendix A, Telephone Log, 3/25/04).

5.10.7 Coastal Zone Management Program / Coastal Barriers

The project is in the Bristol Bay Coastal Resource Service Area (Bristol Bay CRSA) coastal management district. The district coordinator participated in the agency field trip. He indicated no concerns because the project is inland. However, a Coastal Project Questionnaire (CPQ) was completed and submitted to confirm the project's consistency with the Alaska Coastal Management Program (ACMP). (See Appendix E.)

5.10.8 Wild and Scenic Rivers

The proposed action would not affect rivers listed as wild and scenic.

5.10.9 Farmlands

There are no prime or unique farmlands in Alaska (Appendix A, Agency Coordination, USDA NRCS, 2/10/04).

5.10.10 Energy and Natural Resources

The proposed action would have no measurable effects on local supplies of electricity, fuel, or gravel during either construction or operation. The airport lighting and SREB would require electricity; the City of Manokotak is already planning to upgrade the community's electric generation capacity and has been notified as to the projected demand from the airport (Appendix A, Public Correspondence, 11/18/03). The City would be required to extend overhead electric power lines to the R3 site.

Construction of either build alternative would require fuel use. There may also be an increase in fuel use for ground transport to and from the airport. These increases are expected to be minor.

The only natural resource required for the proposed project is gravel. The amount required for the proposed action would not measurably deplete national, state, or local resources. Furthermore, if the airport is no longer required or is abandoned, the gravel can be re-used.

The No-Build Alternative does not require additional electricity, fuel, or gravel.

5.10.11 Light Emissions

For either build alternative, the light emissions are not expected to create annoyance among people near the airport. The runway lighting systems provided with the project are radio-activated and only illuminated for 15 minutes when aircraft are landing or taking off. The airport would be located far enough away from both parts of the community that the rotating beacon light would not shine into any residential windows. The No-Build Alternative would not change light emissions associated with the airport.

5.10.12 Fish, Wildlife, and Essential Fish Habitat

The Igushik and Weary Rivers are anadromous fish water bodies, and a Title 41 Fish Habitat Permit would be needed if any of the following were conducted below the ordinary high water level of either:

- Placing fill or removing material
- Operating equipment
- Fording
- Stabilizing banks
- Constructing ice bridges
- Crossing winter streams
- Constructing barge off-loading ramps or bulkheads

It is not expected that any such activities would be required for the contractor's mobilization or for construction of the project. The barge landing is adequate, and construction material is expected to come from the inland sources previously discussed. If, however, the contractor chooses to use an in-stream material site, he shall be required to acquire all necessary permits and clearances.

Impacts to wildlife due to the loss of habitat are considered minimal. See Section 5.5, Biotic Communities, and the wetlands values discussion in Section 5.6, Wetlands, for information on wildlife habitat impacts.

5.10.13 Environmental Justice

The project does not bear a disproportionate amount of adverse environmental effects to minority, elderly, and/or low-income populations. In fact, either build alternative would have positive impacts on the residents, the majority of whom are minority and/or low income.

6.0 COORDINATION

6.1 Agency Coordination

Early coordination with the State and Federal agencies included letters, an agency scoping meeting, and an agency field trip. Agency coordination is summarized below. See Appendix A for copies of agency correspondence, meeting minutes, and an agency coordination log.

6.1.1 Initial Agency Scoping Letter

On August 21, 2003, an agency coordination letter was distributed to:

- Introduce the project to the agencies
- Present the preliminary design alternatives
- Summarize the project background
- Allow the agency representatives to discuss their initial questions, comments, and/or concerns with project team members
- Provide a summary of potential impacts identified from preliminary research
- Give notice of an informational meeting held on September 3, 2003
- Invite agencies to participate in a field trip on September 4, 2003*

*On August 28, 2003, the agencies were faxed a notice of change to the field trip date. Due to a conflict in scheduling, it was necessary to postpone the field trip to September 11, 2003.

6.1.2 Informational Meetings and Field Trip

The informational meeting took place in Anchorage on September 3, 2003, with four agencies represented. The meeting presented the preliminary design alternatives and allowed the agencies to discuss their initial questions, comments, and/or concerns with project team members.

An agency scoping field trip was conducted concurrent with the second public meeting on September 11, 2003. The trip was a chance for the agencies to look at extension of the existing airport and the possible relocation sites as well as discuss any issues they perceived in relation to the project alternatives. An additional teleconference was held on October 14, 2003, to discuss wetlands issues. See Appendix A for documentation of all agency coordination.

6.1.3 Follow-Up Agency Scoping Letter

A letter was sent to agencies on February 20, 2004, to update them on the project's progress. It introduced the Engineering Preferred Alternative (R3), discussed the changes to the two build alternatives being carried forward (R3 and E1), and explained the rationale for eliminating alternatives no longer being considered (E2, R1, R1A, and R2).

6.2 Public Involvement

The public outreach involved three meetings and three newsletters, as well as telephone and email communications. Public meetings were advertised in project newsletters and display advertising in the *Anchorage Daily News* and the *Bristol Bay Times*. Copies of the newsletters, mailing list, advertisements, and telephone logs are available in Appendix A.

6.2.1 Newsletters

Newsletter #1 – February 2002

The first newsletter introduced the project to the community. It described the project's scope, purpose, and need; identified the project team and explained how to contact them; requested initial input from the community; and announced a public meeting to be held at Old Manokotak School on March 13, 2002.

Newsletter #2 – September 2003

The second newsletter (erroneously published as #3) described the condition of the existing airport in more detail and introduced the preliminary alternatives both for expansion at the current site and for relocation. An 11"x17" graphic showed the airport alternatives under consideration, along with other key features such as access roads and borrow sites. The newsletter also announced the second public meeting, scheduled for September 11, 2003, and requested comments.

Newsletter #3 – January 2004

This newsletter identified the engineering preferred alternative (R3); explained that this alternative and Alternative E1 would both be carried forward into the Environmental Assessment; announced a public meeting to be held on January 29, 2004; and solicited public comment on the alternatives. An 11"x17" graphic showed the updated alternatives along with their access roads, potential material sites, etc.

6.2.2 Public Meetings

Public Meeting #1 – March 13, 2002

The first meeting, attended by 52 Manokotak residents, was held at the Old Manokotak School on March 13, 2002. Attendees were provided with an agenda and a community questionnaire to be filled out and returned at the meeting or mailed to PDC, Inc. Consulting Engineers (PDC) afterwards. To encourage attendance, a drawing for door prizes was held at the close of the meeting. An interpreter was available throughout the project team's presentation and for the question and answer session that followed. A laminated aerial map (scale: 1"=200') with two airport transparencies, an 11"x17" airspace graphic, and a project process flow chart display were used for presentation. The transparencies depicted the following airport configurations—3,300-foot runway with a Non-Precision Approach, edge and end lights to allow landings in the dark, and a GPS approach for use in poor weather. Potential orientation and location of facilities on the existing site and at alternative sites were discussed.

Comments were solicited from attendees, both verbally and by questionnaire, regarding future aviation needs of the community. Manokotak residents supported airport improvements at Manokotak. Their concerns at the meeting centered around the:

- Need to coordinate this airport project with the landfill project
- Maintenance of the airport and access roads – who does it and who pays for it
- Distance of a relocated airport from the community and facilities such as the clinic
- Timing of improvements
- Growing population and long term needs

The questionnaire inquired about access, current airport use, future use if airport were expanded, how residents receive their supplies, and their concerns. Questionnaire respondents favored airport improvements at Manokotak but were not overwhelmingly in favor of either relocating the airport or upgrading the existing. Eighteen of the respondents supported airport relocation; 11 did not support airport relocation.

Public Meeting #2 – September 11, 2003

The second community meeting was held at the new Manokotak School near Manokotak Heights Subdivision. Fifty-five Manokotak residents, six project team members, and eight representatives of Federal, State, and local agencies attended the meeting. An aerial photograph overlain with a map showing the airport alternatives, 11"x17" airspace graphics, wind rose figures showing wind conditions at current and alternative airport locations, and a project process flow chart display were presented. Handouts included an abbreviated agenda, comment sheets, door prize tickets, and door prizes. Door prizes and food were provided as incentives to boost public attendance. A local resident provided language interpretation.

The main purpose of this meeting was to present the preliminary alternatives, explain the pros and cons of each, and allow the community to respond with comments. The discussion focused on three alternatives: Alternative E1, extension of the existing runway; Alternative R1A, relocation to a site just south of the Weary River Access Road; and Alternative R3, relocation farther south of the Weary River Access Road. (Alternatives R1A and R3 were also called the “5-mile” and “8-mile” sites, respectively, based on their distance from the existing airport.) The discussion reiterated many of the concerns brought up at the first meeting, as well as:

Photo 2 - Public Meeting #2

- Condition of the existing airport and marginal weather conditions often encountered there
- Cost of maintenance
- Distance to the relocation sites
- Concerns that R1A (5-mile) was near the proposed landfill
- Observations that R3 (8-mile) would open up additional land for the community to grow
- Concerns about the distance to the airport in a medevac emergency situation
- Road maintenance costs
- Costs to be borne by the community

Although the discussion was lively, the meeting did not reveal any community consensus in favor of a single alternative. Most comments made at the meeting generally favored relocation, but some residents later suggested that this may have been influenced by the meeting venue's location near Manokotak Heights. Of the written comments received after the meeting, seven were in favor of Alternative R3, and three supported Alternative E1 (Appendix A, Public Involvement).

Public Meeting #3 – January 29, 2004

The third community meeting was held at the Tribal Children's Services Building in Old Manokotak. Twenty-seven Manokotak residents attended, along with representatives from ADOT&PF, PDC, Village Safe Water (VSW), and VSW's consultant for the landfill relocation. To boost meeting attendance, CB radio announcements were made and a free shuttle arranged to transport Manokotak Heights residents to the meeting. The purpose of this meeting was to discuss the airport alternatives being carried forward into the EA, including the Engineering Preferred Alternative, and seek community input. A local resident provided interpretation during the meeting. A presentation of the airport project alternatives, environmental process, and project schedule was given, followed by a presentation of the sanitation alternatives (landfill and lagoon) by VSW and their consultant.

Photo 3 - Public Meeting #3

Presentation materials used in the meeting included:

- Aerial photograph of Manokotak overlain with the two build alternatives
- Poster comparing the build alternatives with respect to the criteria used to assess the engineering preferred alternative
- Project process flow chart display
- List of the topics to be discussed in the EA (poster and handout)
- Project schedule
- Handouts of the meeting agenda
- Comment sheets with addressed envelopes
- Copies of Newsletter #3 were also made available

Meeting discussion centered on the history of the airport; the need for maintenance equipment; timing of constructing a new airport or upgrading the existing airport; medevac concerns; and snow removal requirements on the airport and access road.

The project team encouraged the community leaders to determine which alternative the majority of the residents feel would work best for them and provide this information to ADOT&PF. The City, Village Corporation, and Village Council were provided sample resolutions for consideration. The community leaders were provided with copies of the public comments received to date and later

faxed the comments received at this meeting. Presentation boards were also left to aid them in further community discussions of the alternatives. In addition, a summary of research results for road maintenance funding was left with the City. Because of the concern about road maintenance for Alternative R3, research was conducted to find state or federal grants or other funding programs for maintenance of village "roads to schools." See attachment to meeting notes for summary of research (Appendix A, Public Involvement).

6.2.3 Other Community Activity

Village Safe Water Meeting

A meeting was conducted by the ADEC VSW program regarding options for the proposed new community landfill on June 4, 2003. ADOT&PF made a presentation to the community regarding the status of the airport project and discussing the separation distance requirements between airports and landfills.

Village Safe Water Survey

In July 2003, VSW conducted a survey for the sewage lagoon relocation project. They included questions about the airport because distance from the airport is an important consideration when choosing a sewage lagoon location. The survey found that 26% of respondents would like the airstrip to remain in the same location, while 45% would like to see it relocated to the Manokotak Heights area (Appendix A, Questionnaires and Comments).

Village Council Meeting

On August 21, 2003, ADOT&PF and FAA met with four members of the Village Council to discuss the project alternatives.

Manokotak High School Student Questions

The high school students at Manokotak High School sent six questions to ADOT&PF to learn more about the airport project. On December 12, 2003, the Department responded to the questions. The response is included in Appendix A, Public Involvement.

Community Vote

The City of Manokotak conducted a door-to-door vote in February 2004 to determine which alternative the community supported. The community as a whole showed strong support for airport upgrades, but the votes were evenly distributed between the two build alternatives. (See emails in Appendix A, Public Involvement.)

Letter of Support for No-Build Alternative

A letter in support of the No-Build Alternative was received by fax on February 5, 2004, from the Manokotarmiut Elders Traditional Council. Although the Council is not the federally recognized tribal government for Manokotak village, the letter is acknowledged as input on the project from some of the community members. The fax is included in Appendix A, Public Involvement.

Petition in Support of Alternative R3

In February 2004, 47 Manokotak residents signed a petition in favor of Alternative R3. The petition cited the community members' safety concerns with the existing facility and Alternative E1 (Appendix A, Public Involvement).

Resolutions Supporting the Preferred Alternative

All three entities in Manokotak have passed resolutions in support of Alternative R3:

- City of Manokotak – April 2004
- Manokotak Village Council – November 2004
- Manokotak Natives Ltd. – November 2004

7.0 LIST OF PREPARERS

The following individuals have been primarily responsible for the development or review of the project and documents.

Table 5 – Project Coordinators

Name	Affiliation/Role	Phone No.	Relevant Experience
Don Baxter, P.E.	ADOT&PF Project Manager	(907) 269-0610	30 years engineering experience; 25 years in planning, design, and construction
Dan Golden	ADOT&PF Environmental Analyst	(907) 269-0537	15 years environmental analyst, 2 years land management, 1 year geologist
Royce Conlon, P.E.	PDC Inc. Engineers Project Manager	(907) 452-1414	17 years airport planning and design experience; 13 years project management experience
Ron Gebhart, P.E.	PDC Inc. Engineers Principal-in-Charge	(907) 452-1414	34 years civil engineering experience; 20 years as principal
Steve Becker, CEP	PDC Inc. Engineers Environmental Coordinator	(907) 452-1414	10 years environmental planning experience; 6 years as environmental project manager
Ken Risse, P.E.	PDC Inc. Engineers Project Engineer	(907) 452-1414	12 years civil engineering and design experience
Shawna Laderach, EIT	PDC Inc. Engineers Environmental Analyst	(907) 452-1414	2.5 years experience as an environmental analyst
Kathryn Knorr, EIT	PDC Inc. Engineers Design Engineer	(907) 452-1414	2.5 years airport design experience and 1 year airport construction experience
Heather Dorsett	PDC Inc. Engineers Technical Editor	(907) 452-1414	4 years experience as a technical editor
Donna Robertson	MACTEC, Inc. Environmental Consultant	(907) 563-8102	13 years wildlife biology and natural resources management
Anne Brooks, P.E.	Brooks and Associates Public Involvement	(907) 272-1877	30 years experience with planning, engineering, and construction projects in Alaska
Sharon McClintock	McClintock Land Associates, Inc. Land Use Study	(907) 694-4499	30 years experience on rural Alaska, land title, site control, and transportation planning
James Dryden	Dryden Instrumentation Wind Data Collection	(907) 344-4995	35 years experience with computers, instrumentation, and data collection

8.0 BIBLIOGRAPHY

Aderman, A. 2003. Togiak National Wildlife Refuge, U.S. Fish and Wildlife Service, Dillingham. Telephone conversation with Sasha Forland, MACTEC Engineering and Consulting, October 16.

Alakayak, L. 2003. City of Manokotak, Manokotak, Alaska. Telephone communication with Brandon Miner, MACTEC Engineering and Consulting, November 24.

ACMP. 1992. Bristol Bay Coastal Resource Service Area Coastal Management Program, Volume 2, Management Plan, June.

ADCED. 2004. Alaska Community Database. Available online at: http://www.dced.state.ak.us.

ADOT&PF, Central Region, Design and Construction, Preliminary Design and Environmental. September 2004. ADOT&PF Field Trip Report For Ridge Materials Site Wetlands Supplemental Investigation.

ADOT&PF, Central Region, Technical Services, Materials Section. April 1986. Manokotak Airport Materials Investigation: Engineering Geology & Soils Report: Centerline Soils.

Alaska Department of Natural Resources (ADNR). 2004. Well Log Tracking System. Available online at: http://info.dec.state.ak.us/welts/default.asp#T2B.

Alaska Land Use Council Bristol Bay Study Group. 1985. Bristol Bay Regional Management Plan and Final Environmental Impact Statement, Vol. 1.

ASCG. September 1993. Juneau Area Transportation Plan, 1993 Update: Anchorage Agency Report, Vol. 2. of 3. Prepared for U.S. Bureau of Indian Affairs.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. FWS/OBS-79/31 Biological Services Program, U.S. Fish and Wildlife Service.

Jackson, R. 2004. Maintenance Foreman, Southwest Region School District, Dillingham. Telephone conversation with Brandon Miner, MACTEC Engineering and Consulting, March 5.

Jordan, A. 2004. City of Manokotak. Telephone conversation with Brandon Miner, MACTEC Engineering and Consulting, March 9.

Liedberg, A. 2004. Togiak National Wildlife Refuge, U.S. Fish and Wildlife Service, Dillingham. E-mail correspondence with Dan Golden, Alaska Department of Transportation and Public Facilities, March 1.

MACTEC Engineering and Consulting. January 2004. Manokotak Airport Improvements, Final Phase I Preliminary Site Investigation. Prepared for PDC, Inc. Consulting Engineers.

MACTEC Engineering and Consulting. January 2004. Manokotak Airport Improvements, Final Wetlands Delineation Report. Prepared for PDC, Inc. Consulting Engineers.

MLA, Inc. November 2003. Manokotak Airport Runway Resurfacing & Extension Project Land Status, Land Cost, and Planned Land Uses. Prepared for PDC, Inc. Consulting Engineers.

ODA. January 2003. Airport Land Use Compatibility Guidebook.

Parsons Brinckerhoff. November 2002. Southwest Alaska Transportation Plan. Prepared for Alaska Department of Transportation and Public Facilities.

PDC, Inc. Consulting Engineers. March 2004. Manokotak Airport Runway Resurfacing & Extension Scoping Report. Prepared for the State of Alaska Department of Transportation and Public Facilities.

Schichnes, J., and M. Chythlook. 1988. Use of Fish and Wildlife in Manokotak, Alaska. Alaska Department of Fish and Game, Division of Subsistence. Technical Paper No. 152.

USACE. 1999. The highway methodology workbook supplement, wetlands functions and values: a descriptive approach. New England District, NAEEP-360-1-30a.

USFWS. 2004. List of Threatened and Endangered Species and Species Information. Available online at: http://endangered.fws.gov. List Updated Daily.

Viereck, L.A., C.T. Dryness, A.R. Batten, and K.J. Wenzlick. 1992. The Alaska vegetation classification. General Technical Report PNW-GTR-286. Portland, Oregon: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

Wright, J. M., and M.B. Chythlook. 1985. Subsistence Harvests of Herring Spawn-on-Kelp in the Togiak District of Bristol Bay. Alaska Department of Fish and Game, Division of Subsistence. Technical Paper No. 116.